

State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

APPENDICES

FOR THE

Report for the Application (Butte County)
and Ambient (Monterey County) Air Monitoring
of Permethrin

Engineering and Laboratory Branch

Monitoring and Laboratory Division

Project No. C97-041a (Application)
C97-041 (Ambient)

Date: November 17, 1998

APPENDIX I
SAMPLING PROTOCOL

State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

Protocol for the Ambient and Application Monitoring
of Permethrin

Engineering and Laboratory Branch

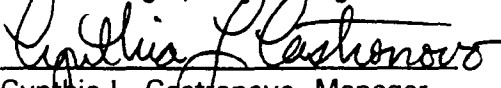
Monitoring and Laboratory Division

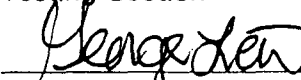
Project No. C97-041

Date: July 28, 1997

APPROVED:


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This protocol has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Protocol for the Ambient and Application Monitoring of Permethrin

I. Introduction

At the request of the California Department of Pesticide Regulation (DPR), (February 7, 1997 Memorandum from John Sanders to George Lew) the Air Resources Board (ARB) staff will determine airborne concentrations of the pesticide permethrin, 3-(2,2-Dichloroethenyl)-2,2-dimethylcyclopropane-carboxylic acid (3-phenoxyphenyl) methyl ester (permethrin), over a six week ambient monitoring period in areas of use which are frequented by people and over a 72 hour monitoring program at an application site. This monitoring will be done to fulfill the requirements of AB 1807/3219 (Food and Agricultural Code, Division 7, Chapter 3, Article 1.5) which requires the ARB "to document the level of airborne emissions of pesticides which may be determined to pose a present or potential hazard..." when requested by the DPR. The monitoring program will be conducted in Butte County in August and September of 1997.

The draft method development results and "Standard Operating Procedures for the Analysis of Permethrin in Ambient Air" (contracted to the University of California, Davis (UCD)) are not included in this protocol but will be included in the draft report.

II. Chemical Properties of Permethrin

Permethrin (CAS: 52645-53-1) exists as either colorless crystals or a light yellow viscous liquid. Technical material contains 60% trans- and 40% cis- isomers. Permethrin has a molecular formula of $C_{21}H_{20}Cl_2O_3$, a molecular weight of 391.29 g/mole, and a specific density of 0.960 at 25°C. It has a water solubility of 0.2 mg/L at 20°C, a Henry's Constant of 1.0×10^{-5} atm·m³/mol at 20-25 °C, and a vapor pressure of 1.88×10^{-8} mmHg at 20 °C. Permethrin is miscible with many organic solvents except ethylene glycol.

Soil microorganisms rapidly hydrolyze permethrin to 3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylic acid and 3-phenoxybenzyl alcohol. When applied at recommended rates, permethrin's soil half-life ($t_{1/2}$) is less than 38 days in soils containing 1.3 to 51.3 percent organic matter with pH ranging from 4.2-7.7. Permethrin degrades by photolysis in aqueous solutions containing various organic solvents and under UV light, or on soil in sunlight. Permethrin's photolytic decomposition results in the isomerization of the cyclopropane moiety and ester cleavage. The identified photolysis products include 3-phenoxybenzyl-dimethyl acrylate, 3-phenoxybenzaldehyde, 3-phenoxybenzoic acid, monochloro-vinyl acids, *cis*- and *trans*-dichlorovinyl acids, benzoic acid, 3-hydroxybenzoic acid, 3-hydroxybenyl alcohol, benzyl alcohol, benzaldehyde, 3-hydroxybenzaldehyde, and 3-hydroxybenzoic acid.

Permethrin's acute oral LD₅₀ is approximately 4,000 mg/kg for rats. Its LC₅₀ (48 hour) is 5.4 ug/L for rainbow trout, and 1.8 ug/L for bluegill sunfish. Based on potential reproductive considerations, permethrin entered the risk assessment process at DPR under the SB 950 (Birth Defect Prevention Act of 1984).

III. Sampling

Samples will be collected by passing a measured volume of ambient air through XAD-4 resin. The resin holders are 4-3/4" long x 1-55/66" O.D. and made of Teflon. Each holder should contain approximately 30cc of specially prepared XAD-4 resin. The resin will be held in place by stainless steel screens on each side of the resin and between the Teflon support rings. The flow rate will be accurately measured and the sampling system operated continuously with the exact operating interval noted. The resin holders will be covered with aluminum foil and supported about 1.5 meters above the ground during the sampling period. At the end of each sampling period the holders will be capped and placed in a zip-lock plastic bag with an identification label affixed. Any fenamiphos present in the sampled ambient air will be captured by the XAD-4 adsorbent. Subsequent to sampling, the sample cartridges will be transported on dry ice, as soon as reasonably possible, to the Department of Environmental Toxicology, University of California, Davis laboratory for analysis. The samples will be stored in the freezer (-20 C) or analyzed immediately.

A sketch of the sampling apparatus is shown in Attachment A. Calibrated rotameters will be used to set and measure sample flow rates. Samplers will be leak checked prior to and after each sampling period with the sampling cartridges installed. Any change in the flow rates will be recorded in the field log book. The field log book will also be used to record start and stop times, sample identifications and any other significant data.

IV. Ambient-Site Air Monitoring

The historical trends in permethrin use suggest that monitoring should occur over a 30- to 45-day sampling period in Monterey County from late August through the end of September. Three to five sampling sites should be selected in relatively high-population areas or in areas frequented by people. Sampling sites should be located near lettuce and celery growing areas. Ambient samples should not be collected from samplers immediately adjacent to fields or orchards where permethrin is being applied. At each site, twenty to thirty discrete 24-hour samples should be taken during the sampling period. Background samples should be collected in an area distant to permethrin applications.

Replicate (collocated) samples are needed for five dates at each sampling location. Two collocated samplers (in addition to the primary sampler) should be run on those days. The date chosen for replicate samples should be distributed over the entire sampling period. They may, but need not be, the same dates at every site. Field spike samples should be collected at the same environmental conditions (e.g., temperature, humidity, exposure to sunlight) and experimental conditions (e.g., air flow rates) as those occurring at the time of ambient sampling.

V. Application Air Monitoring

The historical trends in permethrin use suggest that application-site air monitoring could be conducted in Butte County during June, July, or August associated with applications to peaches. Monitoring should be related to applications at the highest rates of 0.30 pounds permethrin per acre or greater. Permethrin is extensively applied during these periods so care should be taken so that nearby applications do not contaminate collected samples. A

three day monitoring period should be established with sampling times as follows: application + 1 hour, followed by one 2-hour sample, one 4-hour sample, two 8-hour samples and two 24-hour samples. A minimum of four samplers should be positioned, one on each side of the field. A fifth sampler should be collocated at one position. Since permethrin is extensively used in the area, background samples should collect enough volume (either 12 hours at 15 liters/min, or a shorter period with a higher volume pump) to permit a reasonable minimum detection level. Ideally, samplers should be placed a minimum of 20 meters from the field. Field spike samples should be collected at the same environmental (temperature humidity, exposure to sunlight) and experimental (similar air flow rates) conditions as those occurring at the time of sampling.

Additionally, we will provide in the monitoring report: 1) an accurate record of the positions of the monitoring equipment with respect to the field, including the exact distance that the sampler is positioned from the field; 2) an accurate drawing of the monitoring site showing the precise location of the meteorological equipment, trees, buildings, and other obstacles; 3) meteorological data collected at a minimum of 15-minute intervals including wind speed and direction, humidity, air temperature, and comments regarding degree of cloud cover; and 4) the elevation of each sampling station with respect to the field, and the orientation of the field with respect to North (identified as either true or magnetic North).

VI. Analysis

The method development results and "Standard Operating Procedures for the Analysis of Permethrin in Ambient Air" are not included in this protocol but will be included in the draft report.

VII. Quality Assurance

Field Quality Control for the application monitoring will include:

- 1) Four field spikes (same environmental and experimental conditions as those occurring at the time of ambient sampling). The field spikes will be obtained by sampling ambient air during the site background monitoring.
- 2) Four trip spikes, prepared at the same level as the field spikes. These spikes will be kept in the sample cooler on dry ice at all times except for log-in and label attachment.
- 3) Replicate samples will be taken for all samples at one sampling location.
- 4) A trip blank will be obtained.

Field Quality Control for the ambient monitoring will include:

- 1) Five field spikes (same environmental and experimental conditions as those occurring at the time of ambient sampling). The field spikes will be obtained by sampling ambient air at the background site for the same duration and at the same flow rate (collocated) as the ambient sample.

- 2) Five trip spikes prepared at the same level as the field spikes. These spikes will be kept in the sample cooler on dry ice at all times except for log-in and label attachment.
- 3) Replicate samples will be taken at all five sampling locations every Wednesday during the six week monitoring period.
- 4) A trip blank will be obtained each week during the six week monitoring period.

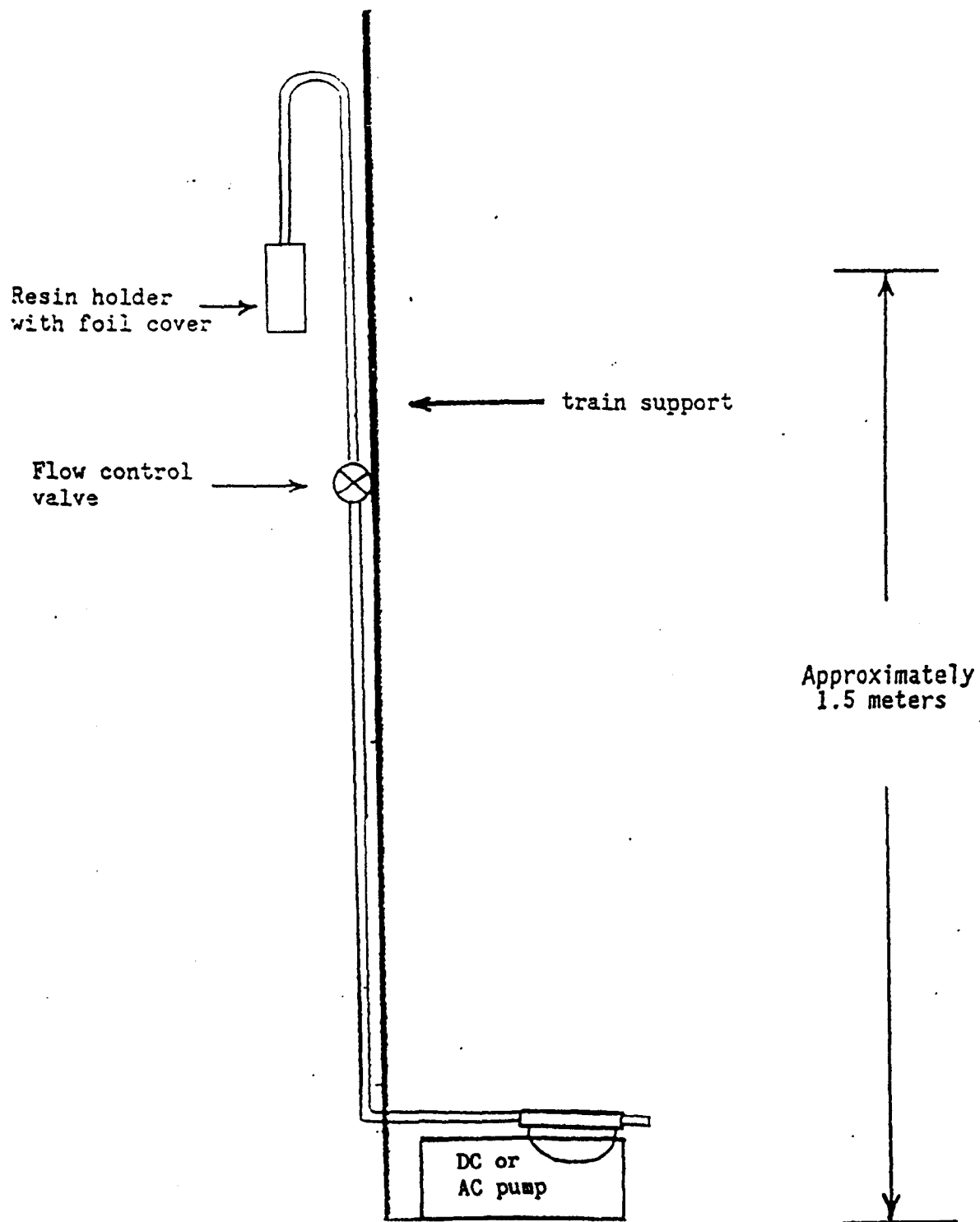
A chain of custody sheet will accompany all samples. Rotameters will be calibrated prior to and after sampling in the field. Samplers will be leak checked prior to and after each sampling period with the sampling cartridges installed. Any change in the flow rates will be recorded in the field log book. The field log book will also be used to record start and stop times, sample identifications and any other significant data.

VIII. Personnel

ARB personnel will consist of Kevin Mongar (Project Engineer) and Instrument Technicians.

Attachment A

FIGURE 1
FIELD SAMPLING APPARATUS



APPENDIX II

LABORATORY REPORT

**Method Development, Ambient Site and Application Site Monitoring for
Permethrin in Air Samples Using XAD-4 Resin as a Trapping Medium**

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Covered Period: July 1, 1997 to October 1, 1997

**Prepared for California Air Resources Board and the California Environmental Protection
Agency**

Disclaimer

The statements and conclusions in the report are those of the contractor and not necessarily those of the California Air Resources Board. The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed as actual or implied endorsement of such products.

Standard Operating Procedure for the Analysis of Permethrin in Ambient Air

1. SCOPE

The proposed analytical method to be employed is a gas chromatographic method with a mass selective detector (MSD) operated in the selective ion monitoring mode (SIM). This method has been used by Environmental Toxicology personnel for the analysis of several pesticides in air samples.

2. SUMMARY OF METHOD

Exposed XAD-4[®] resin samples are stored either in an ice chest with dry ice or at -20 °C in a freezer. Samples are extracted with 75 mL of ethyl acetate and an aliquot is then concentrated prior to injecting 3 µL on to a gas chromatograph equipped with mass selective detector. Resulting areas of both *cis* and *trans* are summed and then reported as total permethrin.

3. INTERFERENCES/LIMITATIONS

Potential interferences may arise due to contaminants in laboratory solvents, reagents, glassware and/or apparatus. A reagent blank and/or control resin blank must be run through the method procedure and analyzed with each set of samples. We reserve the right to change this standard operating procedure should the need arise to handle unforeseen complications with the compounds of interest.

4. EQUIPMENT AND CONDITIONS

A. Instrumentation

Hewlett-Packard 6890 gas chromatograph

Hewlett-Packard GC Autosampler

Hewlett-Packard 5973 Mass Selective Detector (Selected Ion Monitoring, SIM)

Microsoft Excel[®], version 7.0

Injector : 250°C

Detector: 280°C

Column: J & W Scientific[®] XLB 30 m x 0.25 mm I.D. with a 0.25 µm film thickness, Splitless Mode

Temperature program: initial: 180 °C, hold 1.0 min, ramp to 280 °C @ 25 °C/min; hold 9.5 min. Retention time : *cis*-permethrin = 7.9 min. ; *trans*-permethrin = 8.0 min. Both

cis and *trans*-permethrin are analyzed during the same chromatographic run.

Flows:

Carrier (He) = 2.0 mL/min

SIM: m/z 162.9 and 183.0 (Target), 100ms dwell time.

B. Auxiliary Apparatus

1. Rotary platform shaker.
2. 100 mL round bottom flasks.
3. 50 mL graduated cylinders.
4. Rotary evaporator.
5. Disposable pipettes.
6. Nitrogen evaporator (N-Evap).
7. Graduated 15 mL centrifuge tubes.
8. Autosampler vials and screw caps.

C. Reagents

1. Ethyl acetate, pesticide grade.
2. Acetone, pesticide grade.
3. Permethrin, 95.2 % of a 51.2:48.8 ratio of *cis*:*trans*-permethrin.
4. Sodium sulfate, anhydrous.

5. ANALYSIS OF SAMPLES

1. A solvent blank and/or a control resin blank will be analyzed with each set of samples. The blank must be free of interferences for the analysis of both *cis* and *trans*-permethrin.
2. Three resin fortification samples must be fortified, extracted and analyzed with each set of samples.
3. Allow samples to come to room temperature and add 75 mL of ethyl acetate. Cap the sample and swirl for one hour on a rotary platform shaker.
4. Quantitatively transfer 37.5 mL to a 100 mL round bottom flask and evaporate the solvent to dryness using a rotary evaporator.
5. Transfer sample using small aliquots of ethyl acetate to a graduated centrifuge tube. Adjust sample to an appropriate volume for injection on to the GC-MSD.

6. Transfer an aliquot of the adjusted sample to an Autosampler vial.
7. Inject 3 μL of sample, along with the appropriate standard concentrations for *cis*-permethrin and *trans*-permethrin into the gas chromatograph. If the peak height for either the parent isomers, is larger than the highest standard, dilute the sample with ethyl acetate and re-inject.
8. Calculate the mass of total permethrin in μg , based on the linear regression curve using the sum of the areas of *cis*-permethrin and *trans*-permethrin, and the appropriate dilution factors with Microsoft® Excel.

$$\text{Concentration } (\mu\text{g/mL}) \times \text{Dilution Factor (mL)/Sample} = \mu\text{g/sample.}$$

6. QUALITY ASSURANCE

A. Instrument Reproducibility

Quadruple injections of *cis* and *trans*-permethrin standards at six different concentrations were made to establish the reproducibility of the instrument. The data for total permethrin, based on the summed areas for *cis* and *trans* permethrin, is given in Table 1.

Table 1. Instrument Reproducibility for total-Permethrin

total-Permethrin injected ($\mu\text{g}/\mu\text{L}$)	Integration Counts	Percent (%)
25	89469 \pm 20502	\pm 22.9
50	202593 \pm 40604	\pm 20.0
100	449959 \pm 88262	\pm 19.6
200	1139821 \pm 158487	\pm 13.9
400	2998693 \pm 271282	\pm 9.00
800	5489720 \pm 306595	\pm 5.60

B. Linearity

A six point calibration curve of *cis*-permethrin and *trans*-permethrin, with concentrations ranging from 0.025 $\mu\text{g/mL}$ to 0.800 $\mu\text{g/mL}$, was injected 5 times during the course of a run that included a total of 145 injections. The run included XAD resin samples and fortified resin samples. The corresponding equations and correlation coefficients are:

For total permethrin, the linear regression equation is:

$$Y = 7174.2 * x - 154841 \quad \text{Corr} = 0.994$$

C. Minimum Detection Limit

The minimum detection limit (mdl) is set by the minimum concentration injected (25 pg/ μ L) times the minimum total volume (2.0 mL) times the dilution factor (one-half of the sample used). At the present time, the minimum detectable is 0.10 μ g/sample. TAL personnel reserves right to adjust the LOD based on instrumental conditions and exposed resin samples.

Assuming a total air sampling rate of 15 Lpm for 24 hours, the total air volume processed would be: 21 m^3 and the air concentration = $0.10 \mu\text{g}/21 \text{m}^3 = 4.8 \text{ng}/\text{m}^3$

D. Laboratory Recovery Data and Air Collection Efficiency (air trapping) of total permethrin

Laboratory recovery data for total-permethrin is given in Table 3 while air collection data for total-permethrin, with no heat applied, is given in Table 4. Because of permethrin's low vapor pressure, a set of air trapping was done with heat applied to the cartridge, for 5 minutes. These results are given in table 5.

A third set of trapping experiments was done with permethrin fortified directly on the resin instead of the glass wool. This was done to demonstrate that once permethrin was trapped on the resin, it would not migrate or break down. These results are given in Table 6.

Table 3. Laboratory Recovery of Permethrin from Resin Spikes

Sample	Date Fortified	Fortification (μ g)	Recovery (μ g)	% Rec	Permethrin Average	Stdev.
015V50R1	7/11/97	50	58.4	117		
016V50R2	7/11/97	50	53.7	107		
017V50R3	7/11/97	50	48.6	97	107	8.2

Table 4. Permethrin Air Collection Experiments, Spiked to Glass Wool, No Heat^A

Sample 50 (µg)	Sample Type	Glass Wool (µg)	Primary (µg)	Back up ^B (µg)	Trapping ^C Efficiency (%)	Total Mass ^D Recovery (%)
018C/019C/020C	Control	0.08	0.08	0.09		
021/022/023-T	G.W. Fort.	43.4	0.18	0.08	69.2	87
024/025/026-T	G.W. Fort.	44.2	0.12	0.08	58.1	89
027/028/029-T	G.W. Fort.	47.8	0.25	0.08	58.9	96
030/031/032-T	G.W. Fort.	49.1	0.18	<0.10	58.2	99

A: Samplers ran for 24 hours @ ~ 20 Lpm; Maximum temperature 34 °C

B: minimal amount of total-permethrin was found in the back up trap

C: "Trapping Efficiency" is = (Primary (µg) x 100)/(amt. spiked (µg) - amt. recovered on Glass wool)/lab recovery.

D: "Total Mass Recovery" is = [(Glass wool (µg) + Primary (µg)) x 100]/amt. spiked (µg).

Table 5. Permethrin Air Collection Experiments, Spiked to Glass Wool, Heat Applied^{A,B}

Sample 50 (µg)	Sample Type	Glass Wool (µg)	Primary (µg)	Back up ^C (µg)	Trapping ^D Efficiency (%)	Total Mass ^E Recovery (%)
033/034/035	G.W. Fort.	0.05	22.9	1.57	46	49
036/037/038	G.W. Fort.	1.43	29.9	0.07	62	63
040/041/042	G.W. Fort.	0.15	32.0	0.49	64	65
043/044/045	G.W. Fort.	0.81	31.9	0.62	64	67

A: Heat applied via a heat gun for approximately 7 min.

B: Samplers ran for 24 hours @ ~ 25 Lpm; Maximum roof temperature 34 °C

C: Average total permethrin in back up trap was 1.4 µg/sample

D: "Trapping Efficiency" is = (Primary (µg) x 100)/(amt. spiked (µg) - amt. recovered on Glass wool)/lab recovery.

E: "Total Mass Recovery" is = [(Glass wool (µg) + Primary (µg)) x 100]/amt. spiked (µg).

Table 6. Permethrin Air Collection Experiments, Direct Resin Fortification.^A

Sample 50 (µg)		Primary (µg)	Back up (µg)	Trapping Efficiency (%)
045C/046C	Control	<0.10	<0.10	---
047/048	Direct	39.9	<0.10	80
049/050	Direct	38.0	<0.10	76
051/052	Direct	39.2	<0.10	78
053/054	Direct	38.7	<0.10	77

A: Samplers ran for 24 hours @ ~ 20 Lpm; Maximum temperature 34 °C

E. Storage Stability

A 64 day freezer storage stability study (@ -18 °C) was initiated on 7/21/97 and extractd on September 23, 1997. The results are given in Table 7.

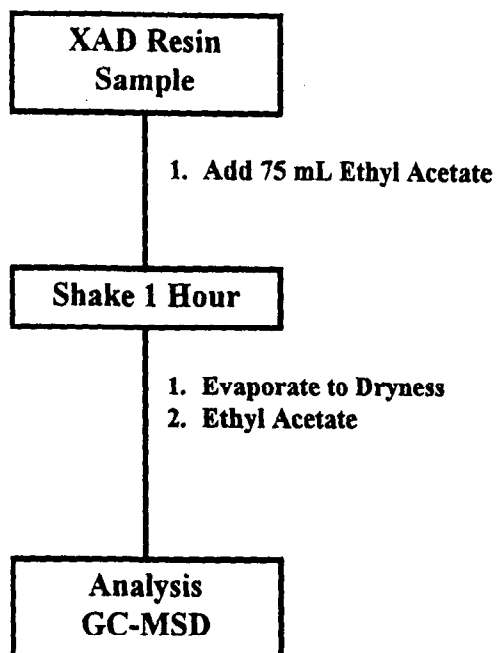
Table 7. 64 Day Freezer Storage Stability Study Results.

TAL#	Total Permethrin (µg)	Percent Recovered	Average % Rec	Stdev
059S50R1	52.2	104%		
060S50R2	52.4	105%		
061S50R3	53.2	106%		
062S50R4	51.7	103%		
063S50R5	51.9	104%		
064S50R6	50.9	102%	104%	2%
065C (Control)	<0.10			

F. Permethrin Confirmation

Permethrin confirmation will be achieved simultaneously during quantitation analysis using selected ion monitoring (SIM) and retention time on the GC-MSD.

Figure 1. Method Schematic of Analysis for Permethrin



Laboratory Concurrent Validation Standards

Concurrent laboratory validation samples, prepared by fortifying 30 mL of resin with a known quantity of permethrin, in triplicate, was run with each set of samples analyzed for all phases of the project.

These phases included preliminary method development and lab recovery study, trapping efficiencies, ARB ambient air monitoring, and application site samples. The results of these samples are given in Table 8.

Permethrin ambient air monitoring, field and trip spike results, and permethrin application site results

The total permethrin ambient air sampling results are given in Table 9 while the permethrin trip, field, and lab spike results (Ambient) are found in Table 10. The results for the application site are given in Table 11, and the concurrent trip, field, and lab spike results (Application) are found in Table 12.

Table 7. Concurrent Laboratory Validation Results (% Recovery).

TAL#	Date Fortified	Type^	Fortification Level (µg)	Total Permethrin (µg)	% Rec	Average % Rec	Stdev
015V50R1	7/11/97	Eff. Study	50	58.4	117%		
016V50R2	7/11/97	Eff. Study	50	53.7	107%		
017V50R3	7/11/97	Eff. Study	50	48.6	97%		
056V50R4	8/5/97	Application	50	60.3	121%		
057V50R5	8/5/97	Application	50	55.3	111%		
058V50R6	8/5/97	Application	50	49.8	100%		
067V50R7	7/18/97	Rec. Check	50	52.1	104%		
068V50R8	7/18/97	Rec. Check	50	51.8	104%		
069V50R9	7/18/97	Rec. Check	50	52.2	104%		
301V50R10	9/23/97	Storage	50	48.8	98%		
302V50R11	9/23/97	Storage	50	48.9	98%		
303V50R12	9/23/97	Storage	50	48.8	98%	105%	8%
229V0.4R1	9/12/97	Amb 5	0.40	0.43	106%		
230V0.4R2	9/12/97	Amb 5	0.40	0.41	102%		
231V0.4R3	9/12/97	Amb 5	0.40	0.39	97%	102%	4%
259V0.5R1	9/19/97	Amb 6	0.50	0.46	93%		
260V0.5R2	9/19/97	Amb 6	0.50	0.44	88%		
261V0.5R3	9/19/97	Amb 6	0.50	0.43	86%	89%	4%
117V0.2R1	8/21/97	Amb 1-2	0.20	0.15	77%		
118V0.2R2	8/21/97	Amb 1-2	0.20	0.14	68%		
118V0.2R3	8/21/97	Amb 1-2	0.20	0.14	68%		
174V0.2R4	8/29/97	Amb 3	0.20	0.19	95%		
175V0.2R5	8/29/97	Amb 3	0.20	0.18	91%		
176V0.2R6	8/29/97	Amb 3	0.20	0.21	105%		
204V0.2R7	9/4/97	Amb 4	0.20	0.18	88%		
205V0.2R8	9/4/97	Amb 4	0.20	0.19	93%		
206V0.2R9	9/4/97	Amb 4	0.20	0.19	93%	86%	13%

A: Eff. Study = Air trapping studies; Rec Check = Laboratory recovery study; Storage = 64 day freezer storage study; Amb = ambient air samples week#.

Table 9. Permethrin Ambient Site Results (8/12/97-8/21/97).

TAL #	ARB Log #	ARB ID	Total Permethrin (µg)
120	1	GPS1	<0.10
121	2	CHS1	<0.10
122	3	SUS1	<0.10
123	4	CAS1	<0.10
124	5	MON1	<0.10
125	6	GPS2	<0.10
126	7	GPS2D	<0.10
127	8	CHS2	<0.10
128	9	CHS2D	<0.10
129	10	SUS2	<0.10
130	11	SUS2D	<0.10
131	12	MON2	<0.10
132	13	MON2D	<0.10
133	14	CAS2	<0.10
134	15	CAS2D	<0.10
135	16	GPS3	<0.10
136	17	CHS3	<0.10
137	18	SUS3	0.10
138	19	MON3	<0.10
139	20	CAS3	<0.10
140	21	GPS4	<0.10
141	22	CHS4	<0.10
142	23	SUS4	0.10
143	24	CAS4	<0.10
144	25	GPS5	<0.10
145	26	CHS5	<0.10

Table 9 Continued. Permethrin Ambient Site Results (8/12/97-8/21/97).

TAL #	ARB Log #	ARB ID	Total Permethrin (ug)
146	27	SUS5	<0.10
147	28	CAS5	<0.10
148	29	GPS6	<0.10
149	30	CHS6	<0.10
150	31	SUS6	0.10
151	32	CAS6	<0.10
152	33	GPS7	0.10
153	34	CHS7	<0.10
154	35	SUS7	0.10
155	36	MON7	<0.10
156	37	CAS7	<0.10
157	38	GPS8	<0.10
158	39	GPS8D	0.10
159	40	CHS8	<0.10
160	41	CHS8D	<0.10
161	42	SUS8	<0.10
162	43	SUS8D	<0.10
163	44	MON8	<0.10
164	45	MON8D	<0.10
165	46	CAS8	<0.10
166	47	CAS8D	<0.10
167	48	GPS9	<0.10
168	49	CHS9	<0.10
169	50	SUS9	<0.10
170	51	MON9	<0.10
171	52	CAS9	<0.10
172	53B	B-9	<0.10

Table 9 Continued. Permethrin Ambient Site Results (8/19/97-8/29/97).

TAL #	ARB Log #	ARB ID	Total Permethrin (µg)
177	53	GPS10	<0.10
178	54	CHS10	<0.10
179	55	SUS10	<0.10
180	56	MON10	<0.10
181	57	CAS10	<0.10
182	58	CAS11	<0.10
183	59	GPS11	<0.10
184	60	CHS11	<0.10
185	61	SUS11	<0.10
186	62	MON11	<0.10
187	63	CAS12	<0.10
188	64	CAS12D	<0.10
189	65	MON12	<0.10
190	66	MON12D	<0.10
191	67	SUS12	<0.10
192	68	SUS12D	<0.10
193	69	GPS12	<0.10
194	70	GPS12D	<0.10
195	71	CHS12	<0.10
196	72	CHS12D	<0.10
197	73	CAS13	<0.10
198	74	MON13	<0.10
199	75	SUS13	<0.10
200	76	GPS13	<0.10
201	77	CHS13	<0.10
202	78	Blank	<0.10

Table 9 Continued. Permethrin Ambient Site Results (9/1/97-9/5/97).

TAL #	ARB Log #	ARB ID	Total Permethrin (µg)
207	79	CAS14	<0.10
208	80	MON14	<0.10
209	81	SUS14	<0.10
210	82	GPS14	<0.10
211	83	CHS14	<0.10
212	84	CAS15	<0.10
213	85	MON15	<0.10
214	86	SUS15	<0.10
215	87	GPS15	<0.10
216	88	CHS15	<0.10
217	89	CAS15D	<0.10
218	90	MON15D	<0.10
219	91	SUS15D	<0.10
220	92	GPS15D	<0.10
221	93	CHS15D	<0.10
222	94	CAS16	<0.10
223	95	MON16	<0.10
224	96	SUS16	<0.10
225	97	GPS16	<0.10
226	98	CHS16	<0.10
227	99	FB16	<0.10

Table 9 Continued. Permethrin Ambient Site Results (9/8/97-9/12/97).

TAL #	ARB Log #	ARB ID	Total Permethrin (ug)
232	100	GPS17	<0.10
233	101	CHS17	<0.10
234	102	SUS17	<0.10
235	103	MON17	<0.10
236	104	CAS17	<0.10
237	105	CAS18	<0.10
238	106	MON18	<0.10
239	107	SUS18	<0.10
240	108	GPS18	<0.10
241	109	CHS18	<0.10
242	110	CAS19	<0.10
243	111	CAS19D	<0.10
244	112	MON19	<0.10
245	113	MON19D	<0.10
246	114	SUS19	<0.10
247	115	SUS19D	<0.10
248	116	GPS19	<0.10
249	117	GPS19D	<0.10
250	118	CHS19	<0.10
251	119	CAS20	<0.10
252	120	MON20	<0.10
253	121	SUS20	<0.10
254	122	GPS20	<0.10
255	123	CHS20	<0.10
256	124	CHS20D	<0.10
257	125	Blank	<0.10

Table 9 Continued. Permethrin Ambient Site Results (9/15/97-9/19/97).

TAL #	ARB Log #	ARB ID	Total Permethrin (µg)
262	126	GPS21	<0.10
263	127	CHS21	<0.10
264	128	SUS21	<0.10
265	129	MON21	<0.10
266	130	CAS21	<0.10
267	131	CAS22	<0.10
271	132	SUS22	<0.10
272	133	GPS22	<0.10
273	134	CHS22	<0.10
274	135	CAS23	<0.10
275	136	CAS23D	<0.10
276	137	MON23	<0.10
277	138	MON23D	<0.10
278	139	SUS23	<0.10
279	140	SUS23D	<0.10
280	141	GPS23	<0.10
281	142	GPS23D	<0.10
282	143	CHS23	<0.10
283	144	CHS23D	<0.10
284	145	CAS24	<0.10
287	146	SUS24	<0.10
288	147	GPS24	<0.10
289	148	CHS24	<0.10
290	149	Blank	<0.10

Table 10. Field, Trip, and Lab Spike Results (Ambient).

TAL #	ARB Log #	ARB ID	Total Permethrin (μg)	Average	Stdev
268	132	FS-1	0.57		
269	133	FS-2	0.49		
270	134	FS-3	0.47		
285	149	FS-4	0.48		
286	150	FS-5	0.50	0.50	0.04
291	155	TS-1	0.51		
292	156	TS-2	0.49		
293	157	TS-3	0.50		
294	158	TS-4	0.43		
295	159	TS-5	0.47	0.48	0.03
296	160	LS-1	0.49		
297	161	LS-2	0.49		
298	162	LS-3	0.44		
299	163	LS-4	0.43		
300	164	LS-5	0.46	0.46	0.03

Note: No Net Permethrin (μg) calculations were made for the Field Spike Samples, all ambient samples for that week were $<0.10 \mu\text{g}$.

Table 11. Application Site Results (7/31/97-8/4/97).

TAL #	ARB Log #	ARB ID	Total Permethrin (µg)
82	14	PERW1	2.72
83	15	PERN1	2.07
84	16	PERE1	0.12
85	17	PERS1	0.86
86	18	PERS1D	0.11
87	19	PERN2	0.16
88	20	PERE2	0.11
89	21	PERW2	0.13
90	22	PERS2	0.12
91	23	PERS2D	0.13
92	24	PERW3	0.14
93	25	PERS3	0.14
94	26	PERS3D	0.12
95	27	PERE3	0.13
96	28	PERN3	0.20
97	29	PERW4	0.20
98	30	PERS4	0.14
99	31	PERS4D	0.13
100	32	PERE4	0.13
101	33	PERN4	0.15
102	34	PERW5	0.30
103	35	PERS5	0.24
104	36	PERS5D	0.15
105	37	PERE5	0.27
106	38	PERN5	0.25
107	39	PERN6	0.25
108	40	PERW6	0.27
109	41	PERE6	0.22
110	42	PERS6	0.19
111	43	PERS6D	0.18

Table 12. Field, Trip, and Lab Spike Results (Application).

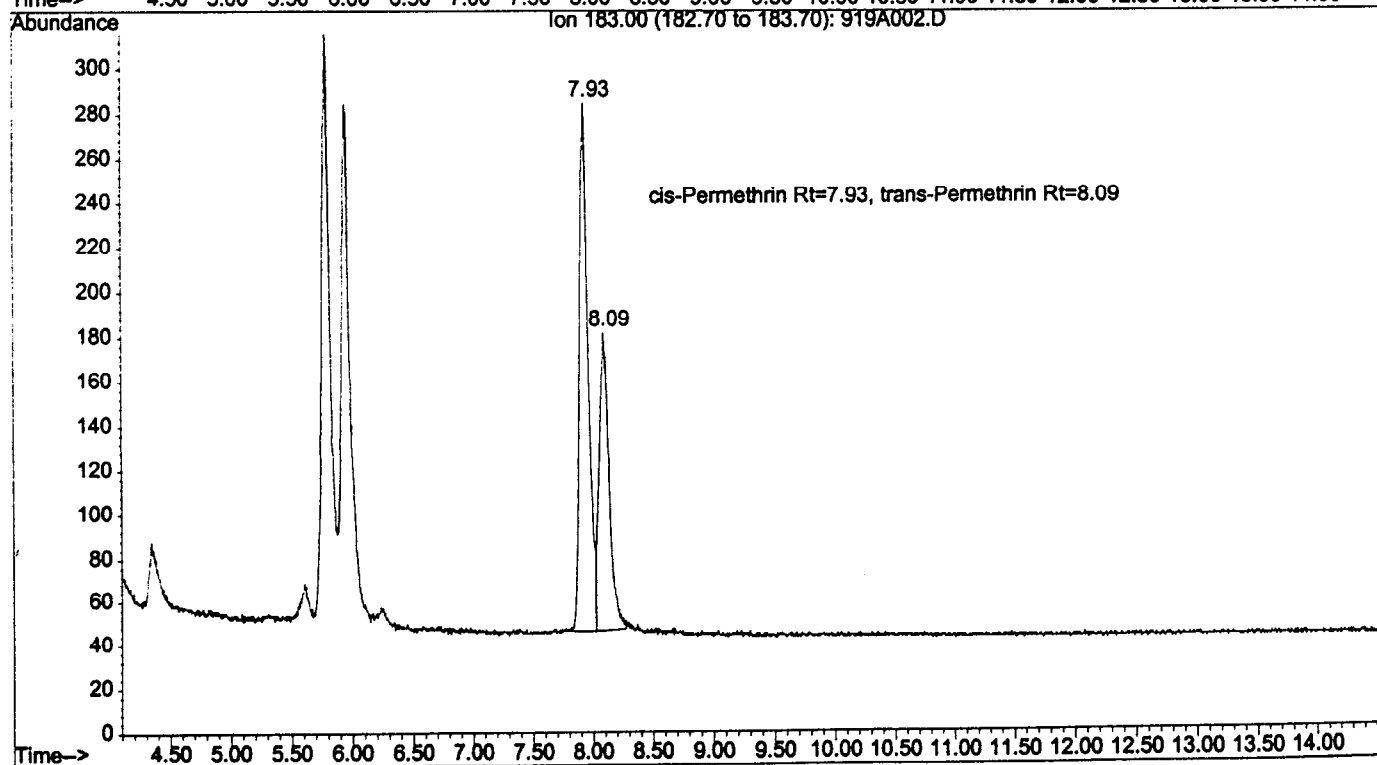
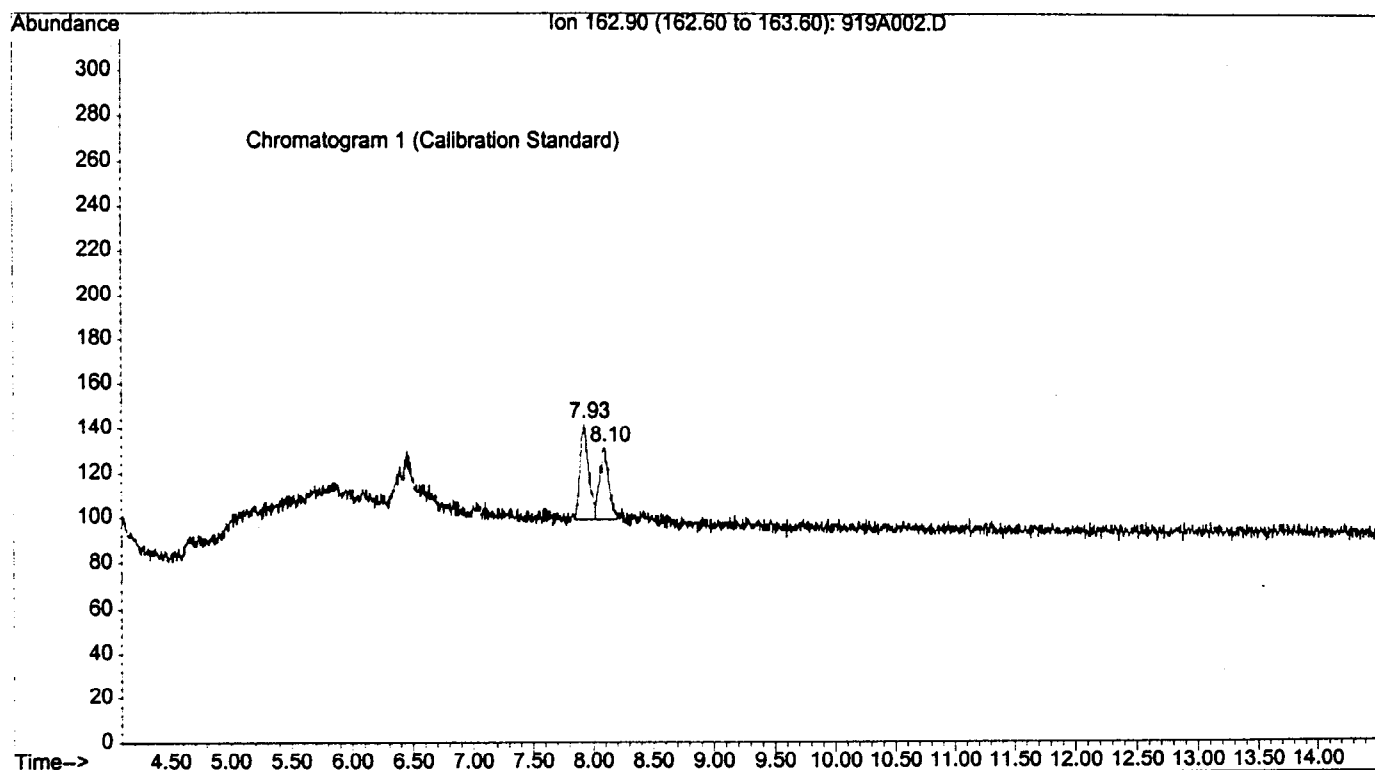
TAL #	ARB Log #	ARB ID	Total Permethrin (ug)	Net ^A Permethrin (μg)	Average	Stdev
70	1	PERBW	0.20			
71	2	FS1W	0.45	0.25		
72	3	PERBS	0.13			
73	4	FS2S	0.56	0.43		
74	5	PERBN	0.10			
75	6	FS3N	0.56	0.46	0.38	0.11
76	8	FS4E ^B	0.53			
77	9	PERTS1	0.46			
78	10	PERTS2	0.43			
79	11	PERTS3	0.42			
80	12	PERTS4	0.45		0.44	0.02
81	13	PERTB	<0.10			
112	44	PERLS1	0.37			
113	45	PERLS2	0.38			
114	46	PERLS3	0.42			
115	47	PERLS4	0.39		0.39	0.02

- A. Net Permethrin (μg) = Total Permethrin (μg) - Concurrent Blank (μg)
eg. FS1W (μg) - PERBW (μg) = Net Permethrin (μg). Only applies to Field Spikes.
- B. FS4E Field Spike did not have a concurrent blank sample (due to pump failure),
therefore, no Net Permethrin calculation was made and the data point was not
included in the averaging.

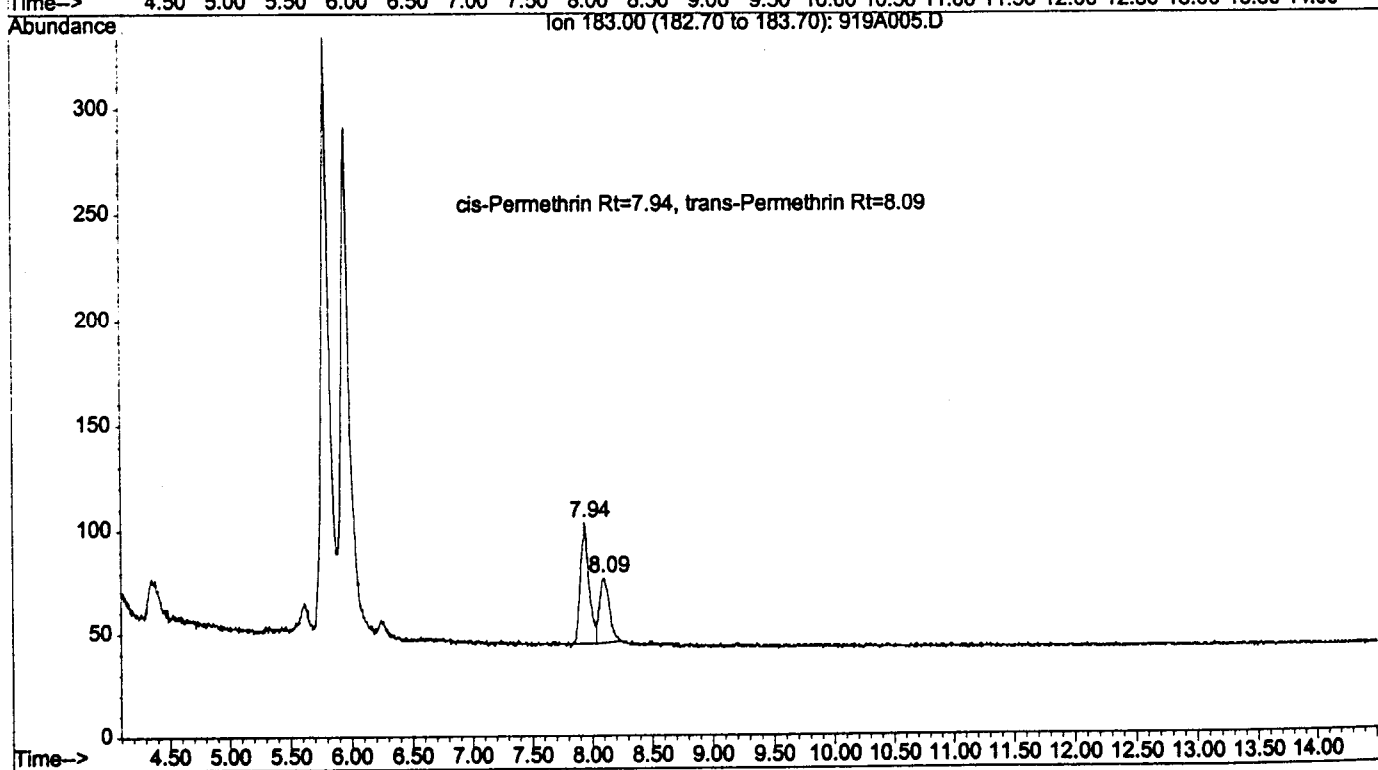
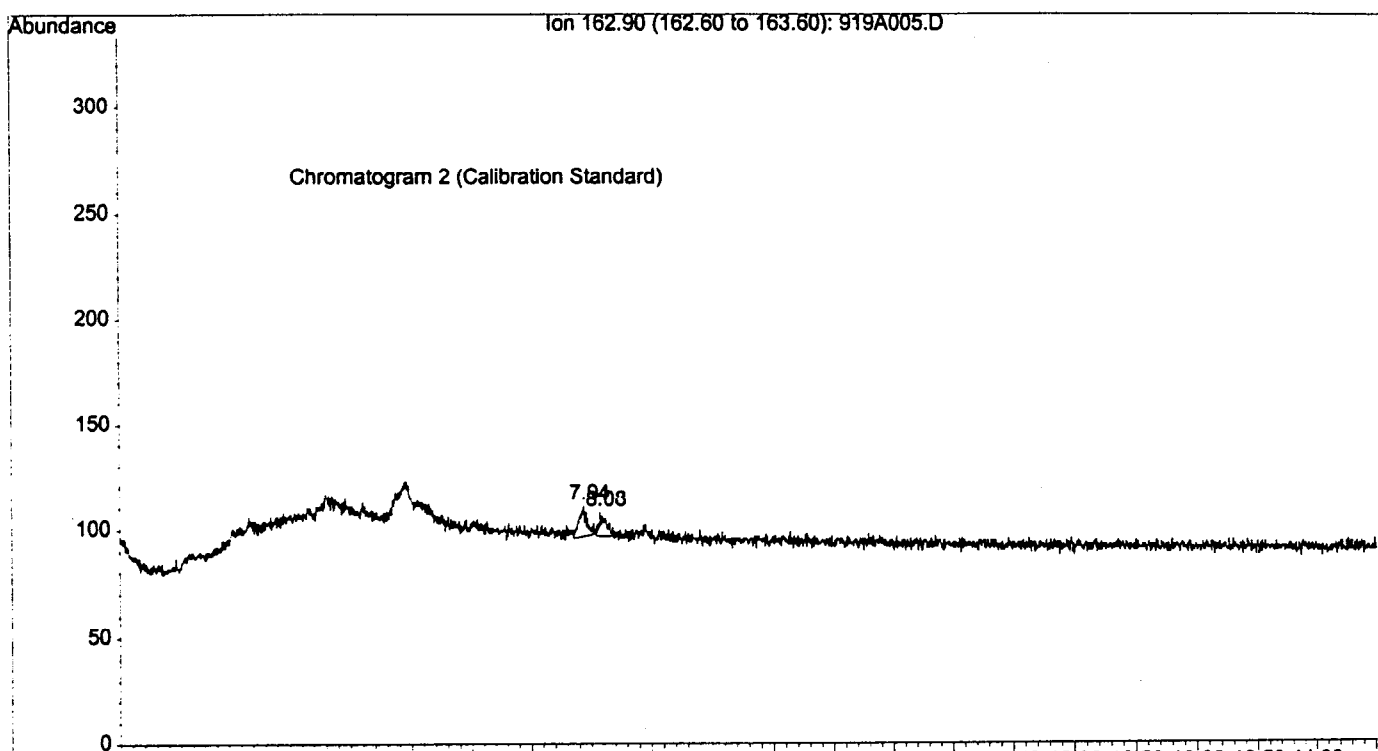
APPENDIX A. GC/MS Sample Chromatograms.

1. Calibration Standard, 100 pg/ μ L.
2. Calibration Standard, 25 pg/ μ L.
3. Resin Blank.
4. Resin Spike, 0.5 μ g.
5. Monitoring Sample.
6. ARB-QA Field Spike.
7. ARB-QA Trip Spike.
8. ARB-QA Lab Spike.
9. Storage Stability Sample, 50 μ g.
10. Application Sample. Small retention time shift from earlier samples (application set) to later samples (monitoring set). No adverse impact on study.

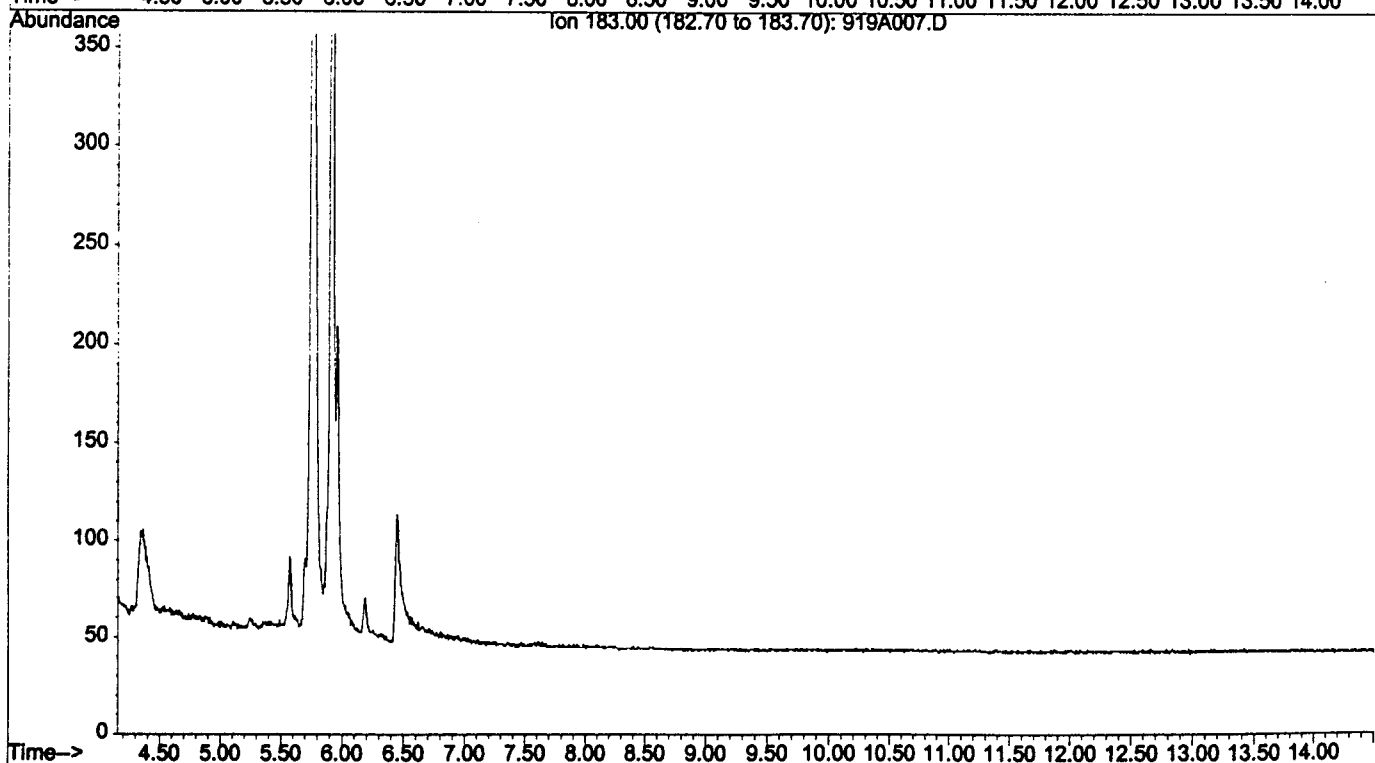
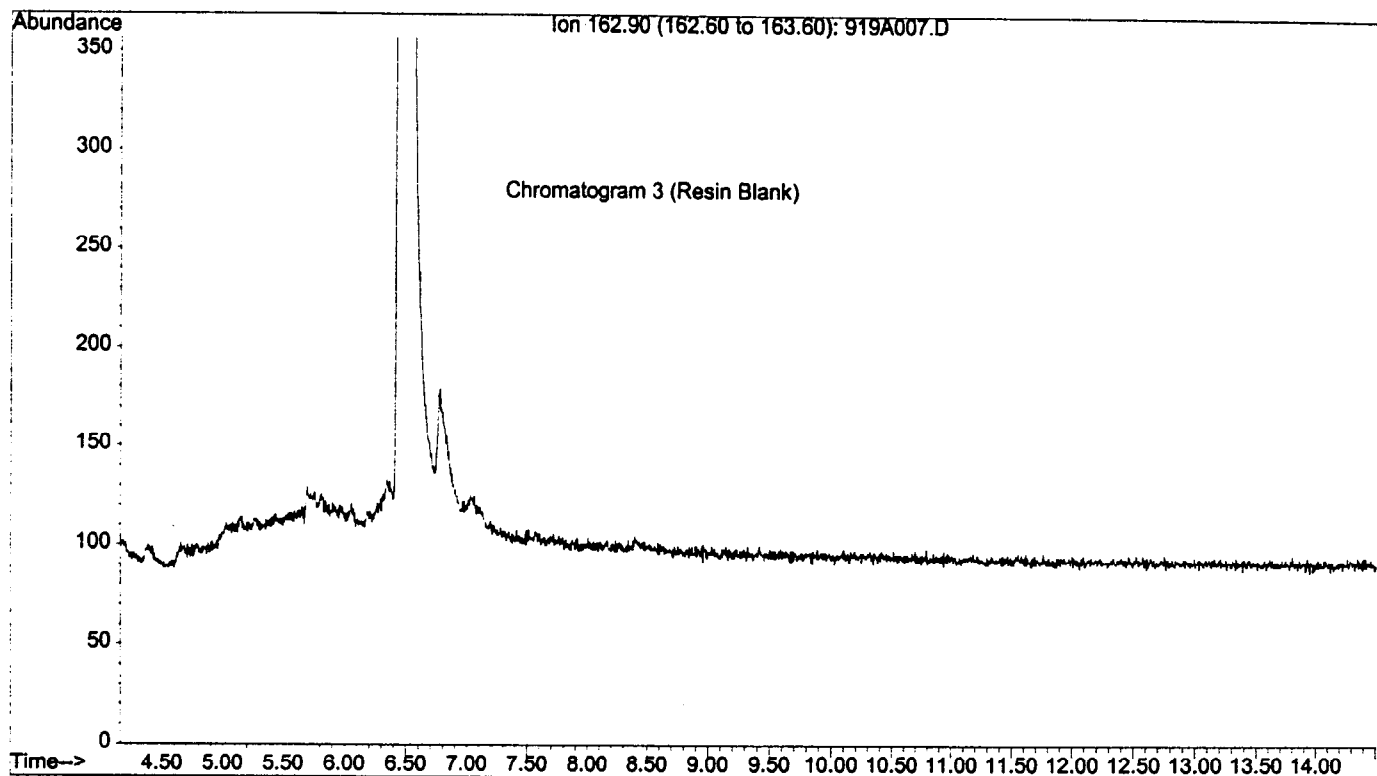
File : D:\DATA\ARB97\PERMETH\091997\919A002.D
Operator : Matt Hengel
Acquired : 19 Sep 97 5:58 pm using AcqMethod PERMETH
Instrument : GC/MS Ins
Sample Name: 100pg/ul lul inj.
Misc Info :
Vial Number: 2



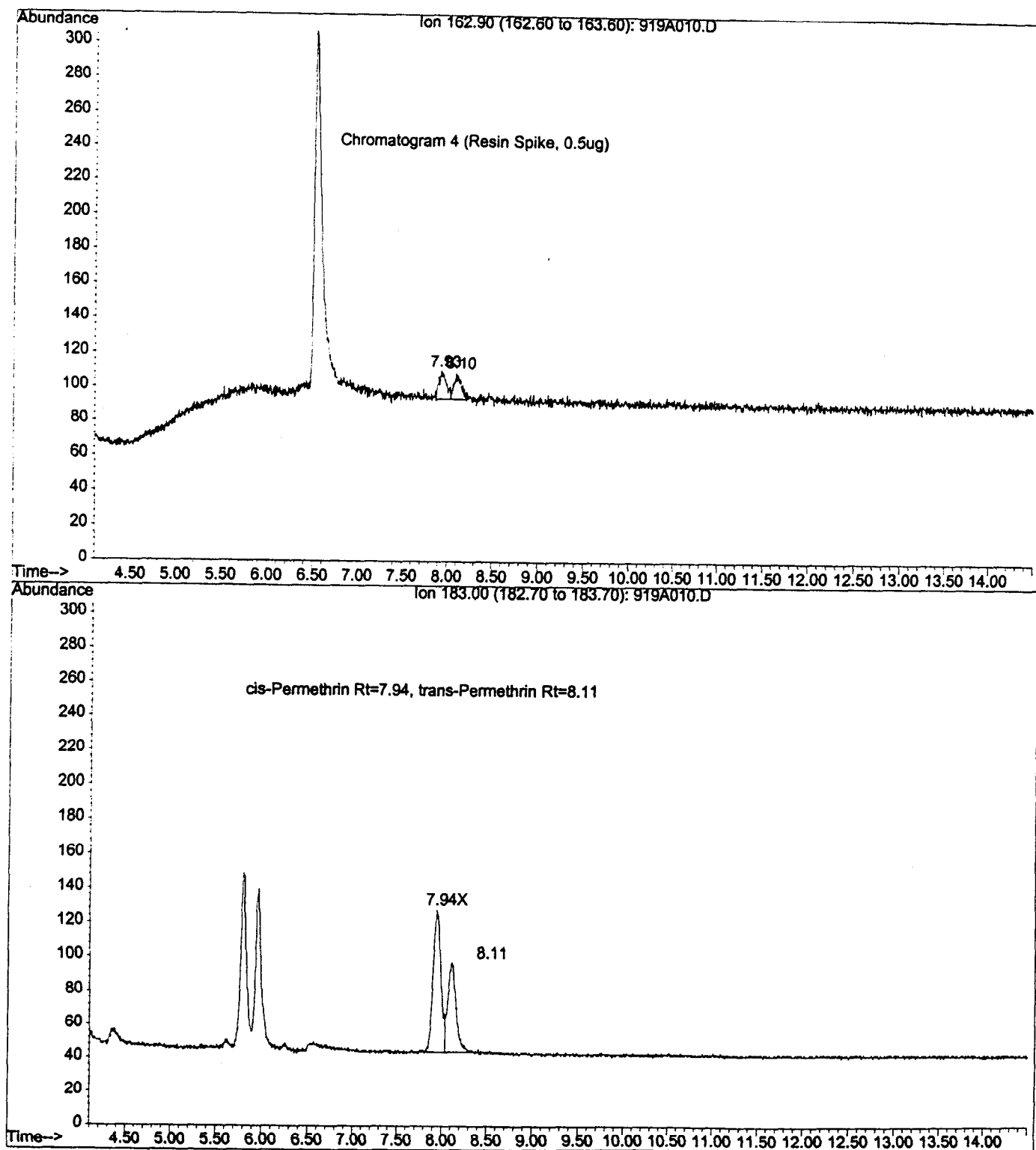
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Operator : Matt Hengel
Acquired : 19 Sep 97 6:51 pm using AcqMethod PERMETH
Instrument : GC/MS Ins
Sample Name: 25pg/ul 1ul inj.
Misc Info :
Vial Number: 5



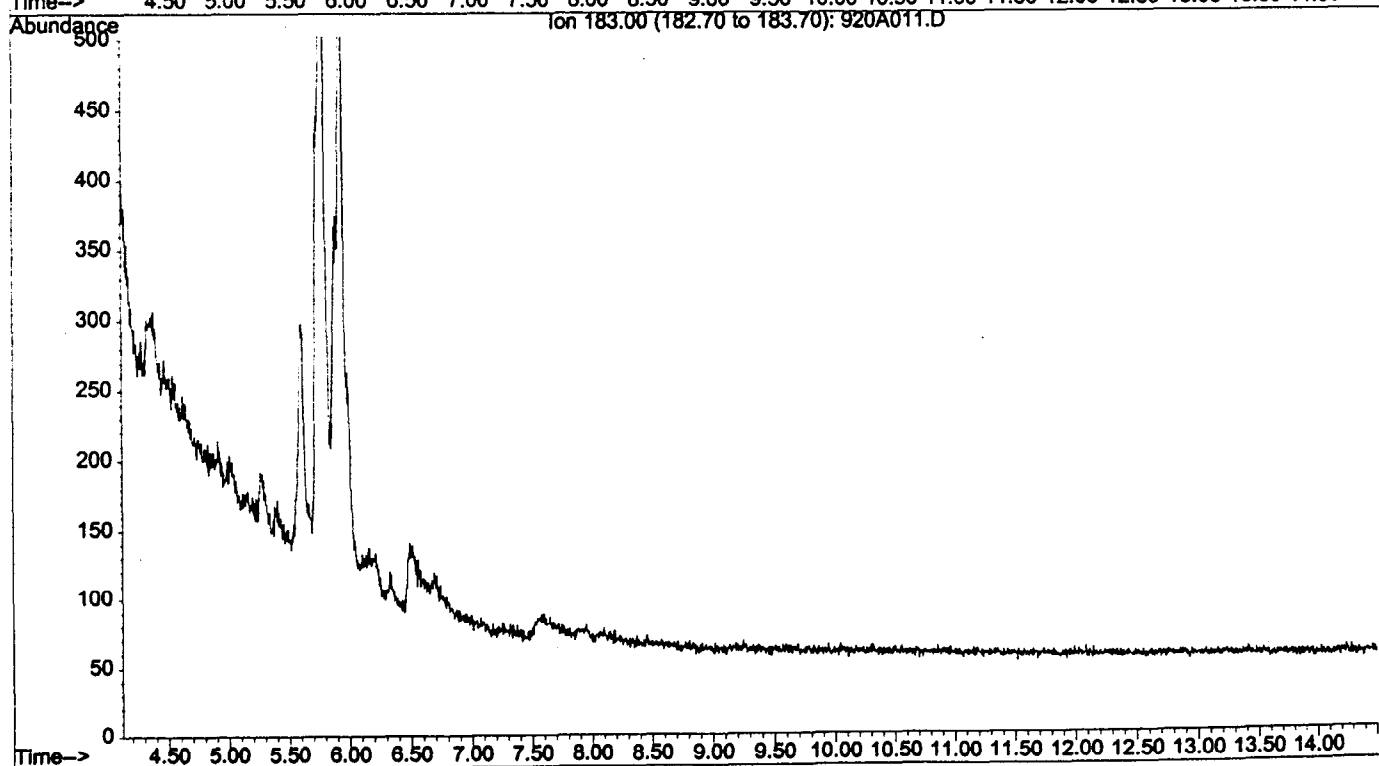
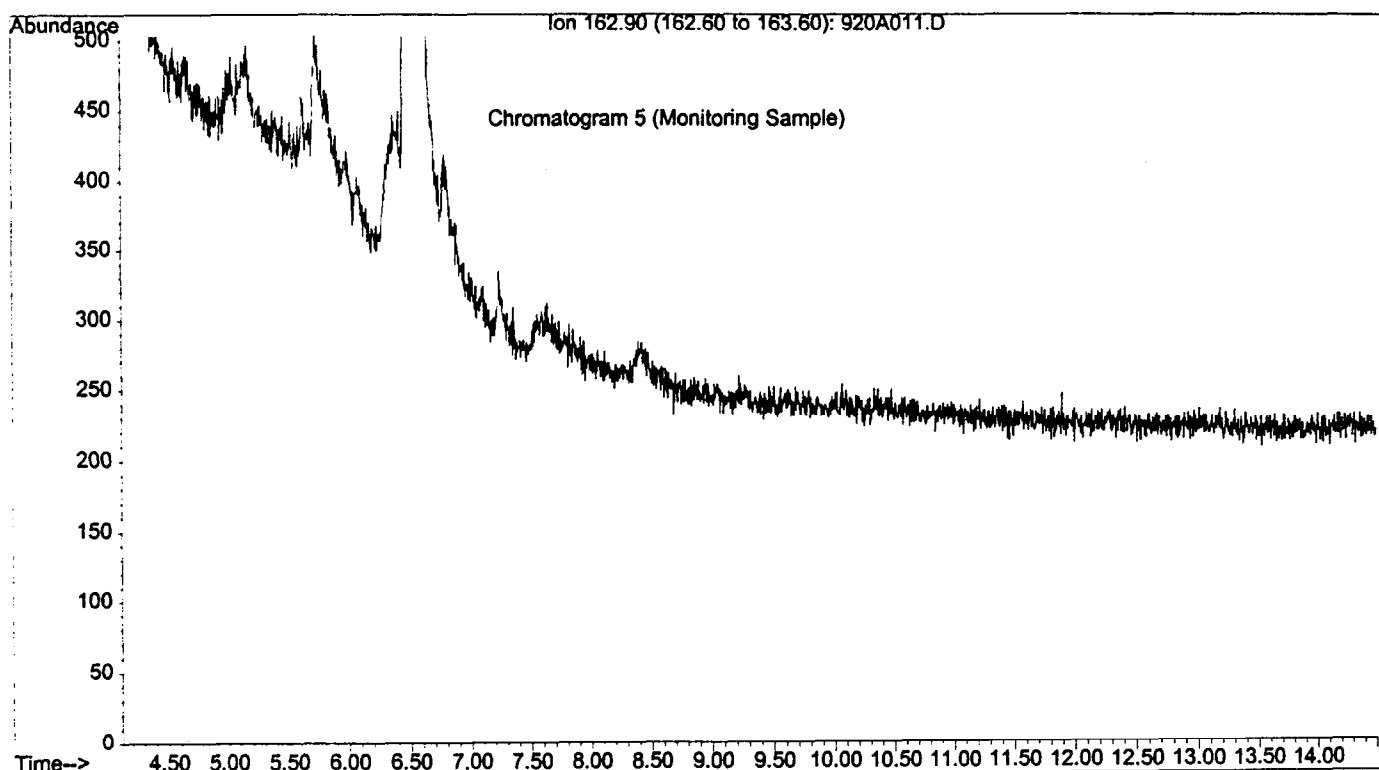
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Operator : Matt Hengel
Acquired : 19 Sep 97 7:27 pm using AcqMethod PERMETH
Instrument : GC/MS Ins
Sample Name: 258C 4ml 1ul inj.
Misc Info :
Vial Number: 6



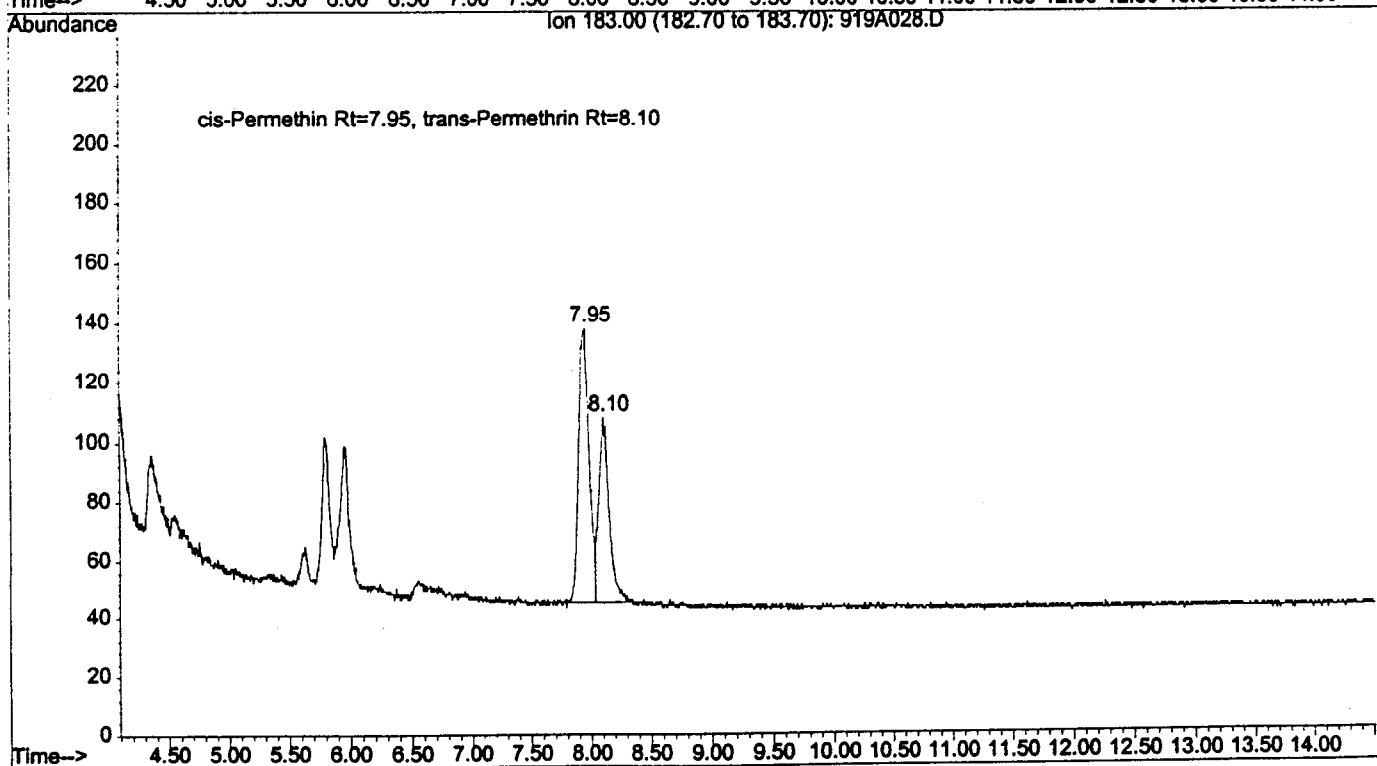
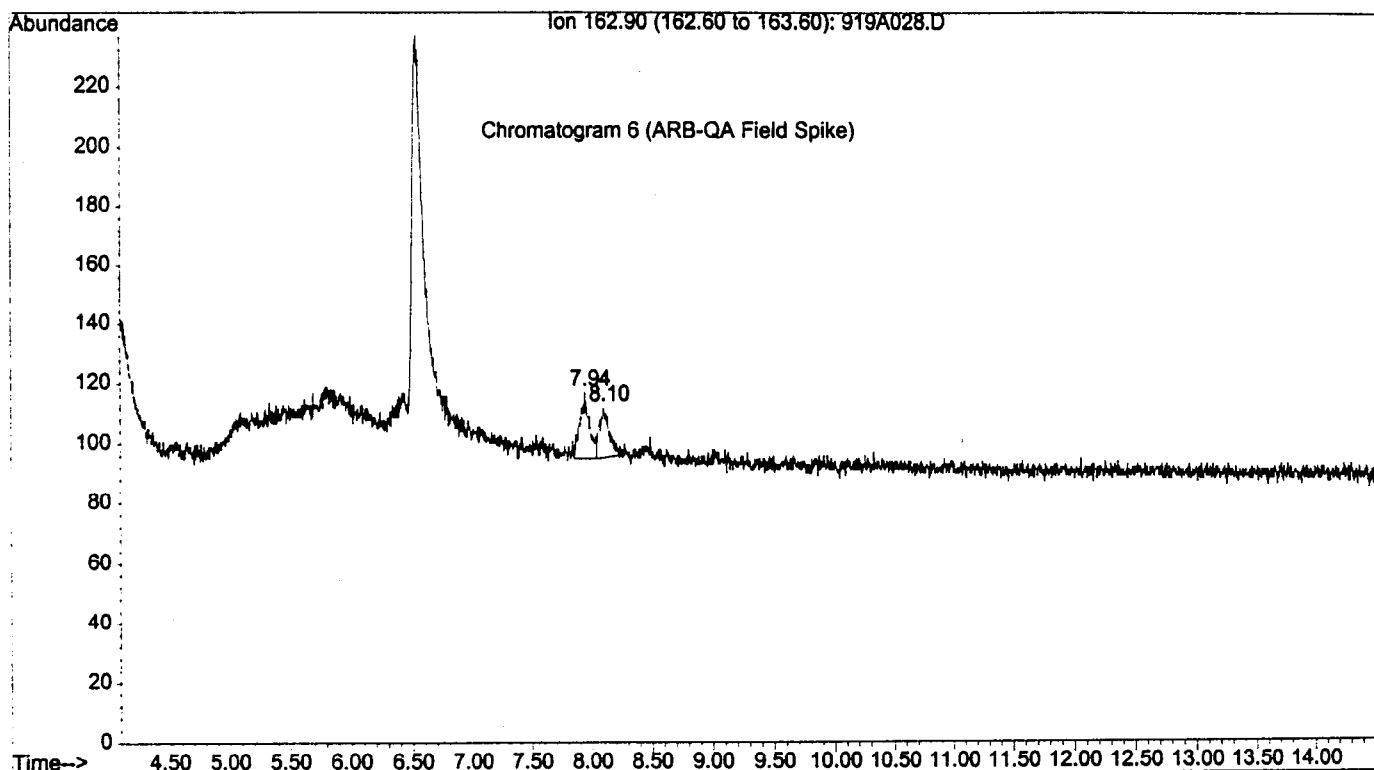
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Operator : Matt Hengel
Acquired : 19 Sep 97 8:21 pm using AcqMethod PERMETH
Instrument : GC/MS Ins
Sample Name: 259V0.5R1 10ml 1ul inj.
Misc Info :
Vial Number: 7



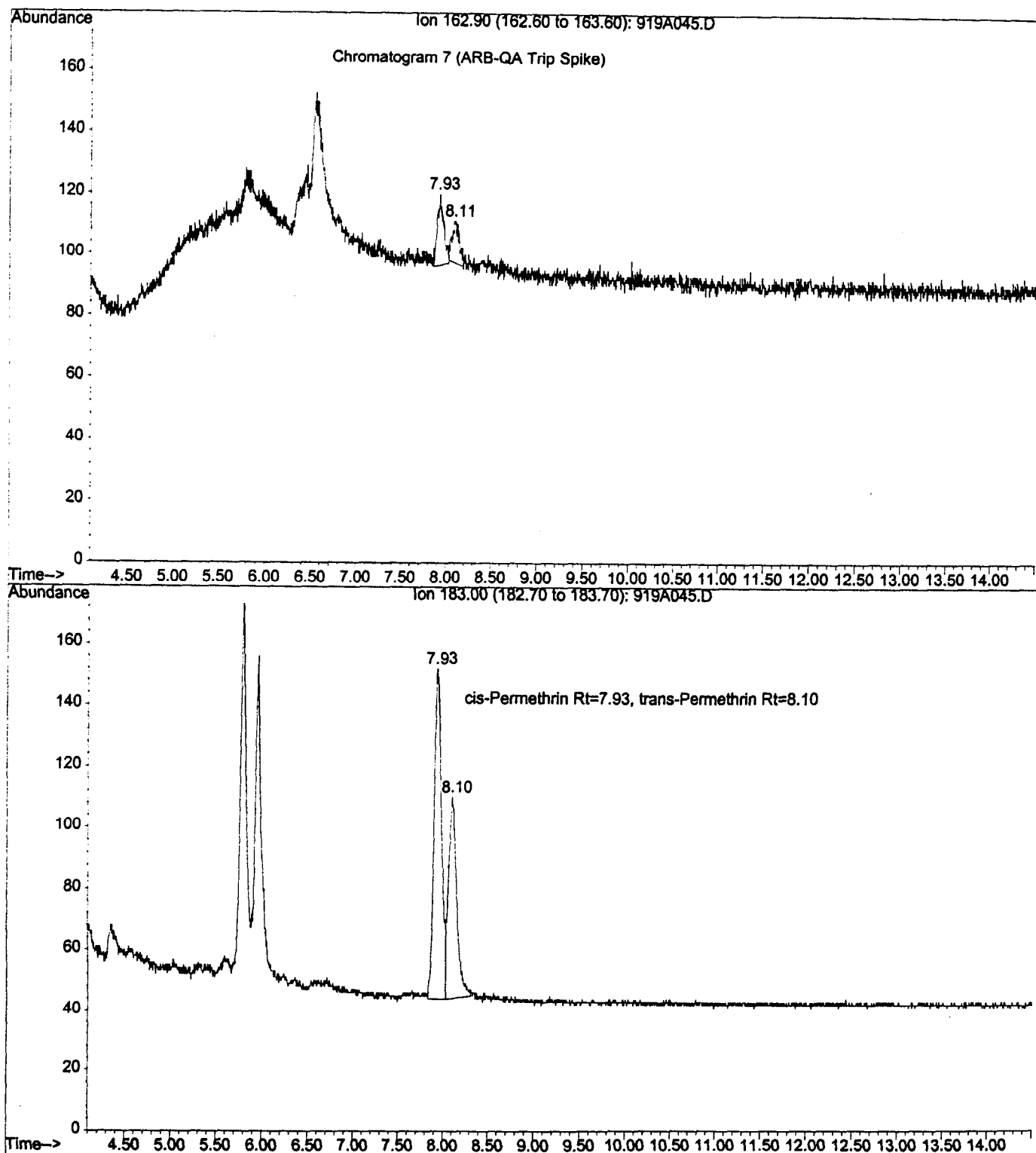
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Operator : Matt Hengel
Acquired : 20 Sep 97 10:21 pm using AcqMethod PERMETH
Instrument : GC/MS Ins
Sample Name: 264 (SUS21) 4ml 1ul inj.
Misc Info :
Vial Number: 8



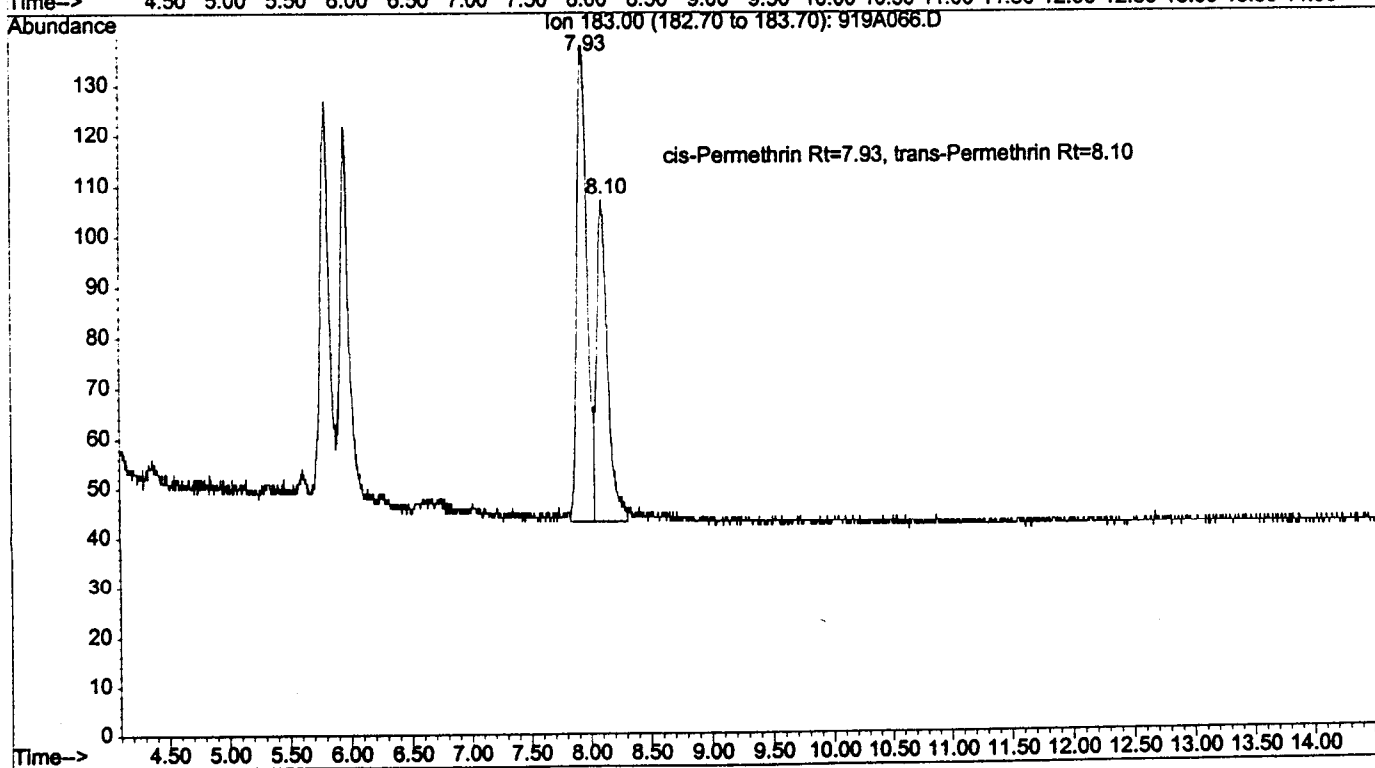
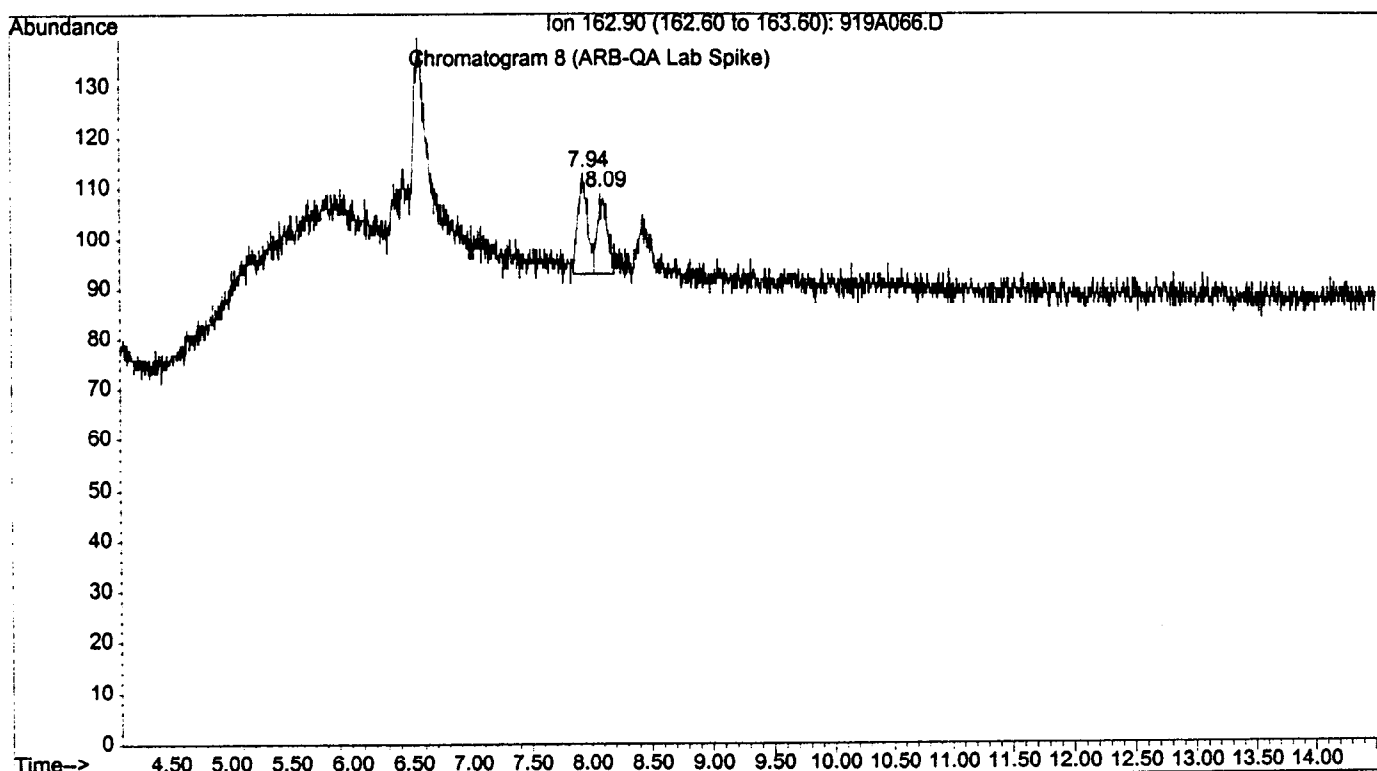
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Operator : Matt Hengel
Acquired : 20 Sep 97 1:42 am using AcqMethod PERMETH
Instrument : GC/MS Ins
Sample Name: 269 (FS-2) 10ml 1ul inj.
Misc Info :
Vial Number: 11



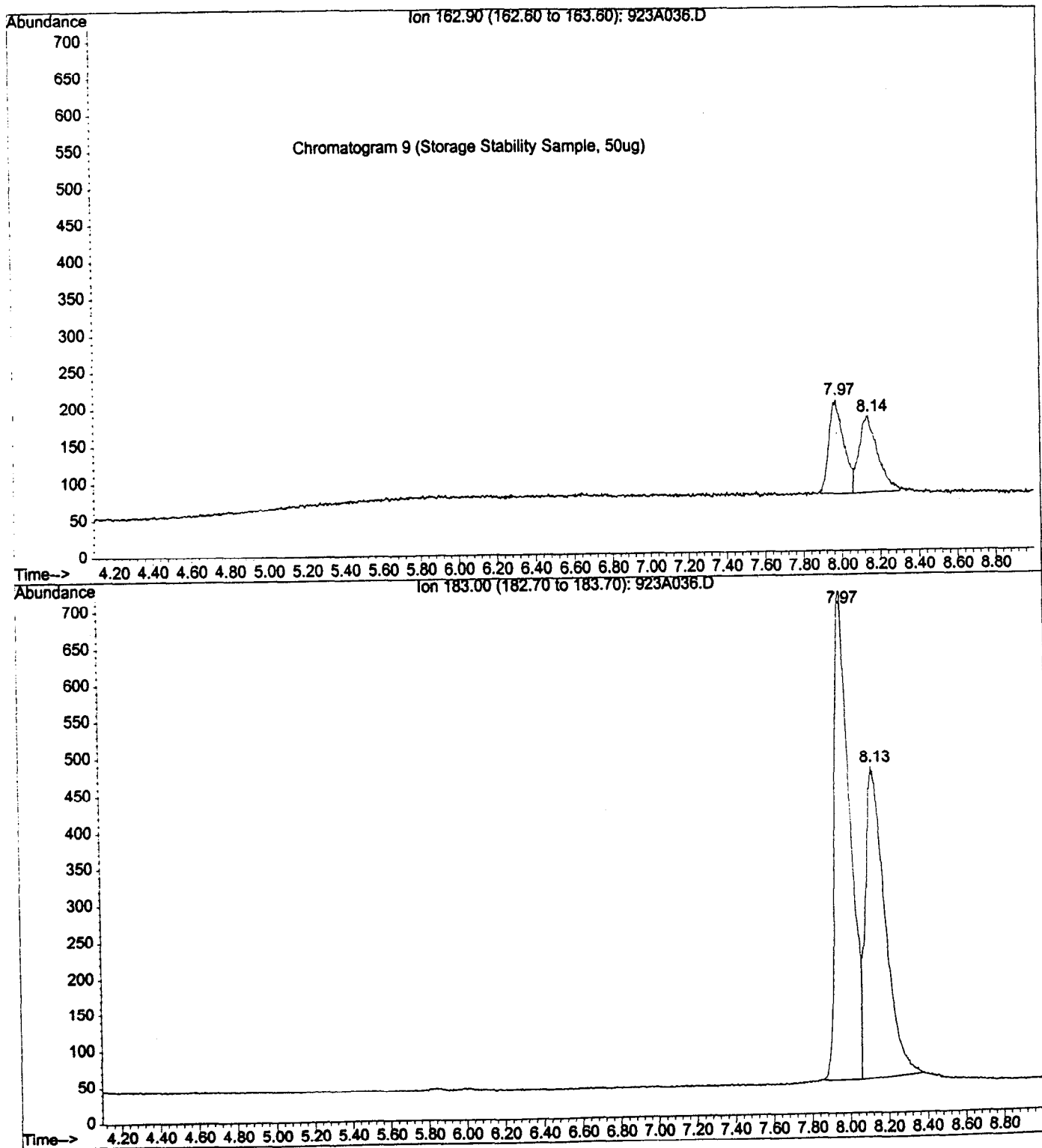
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Operator : Matt Hengel
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Instrument : GC/MS Ins
Sample Name: 291 (TS-1) 10ml 1ul inj.
Misc Info :
Vial Number: 15



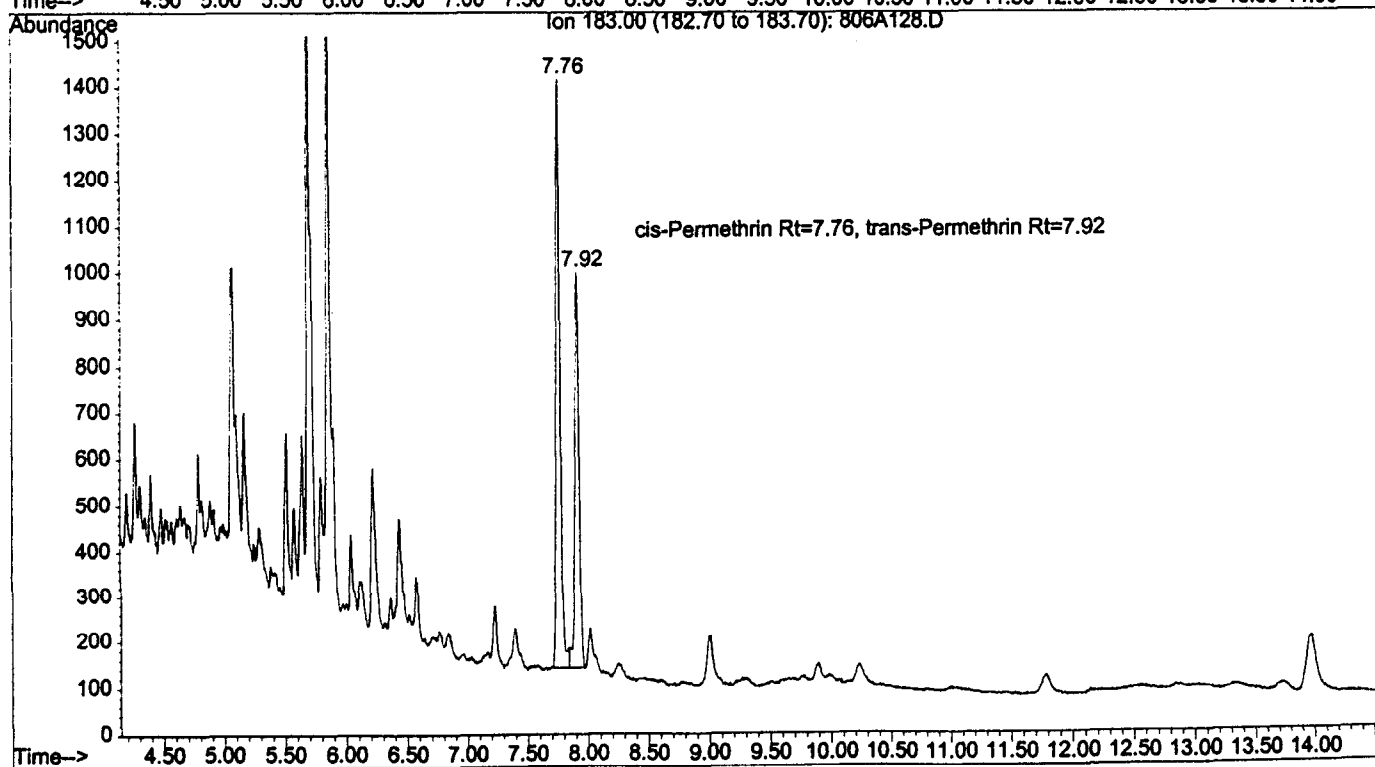
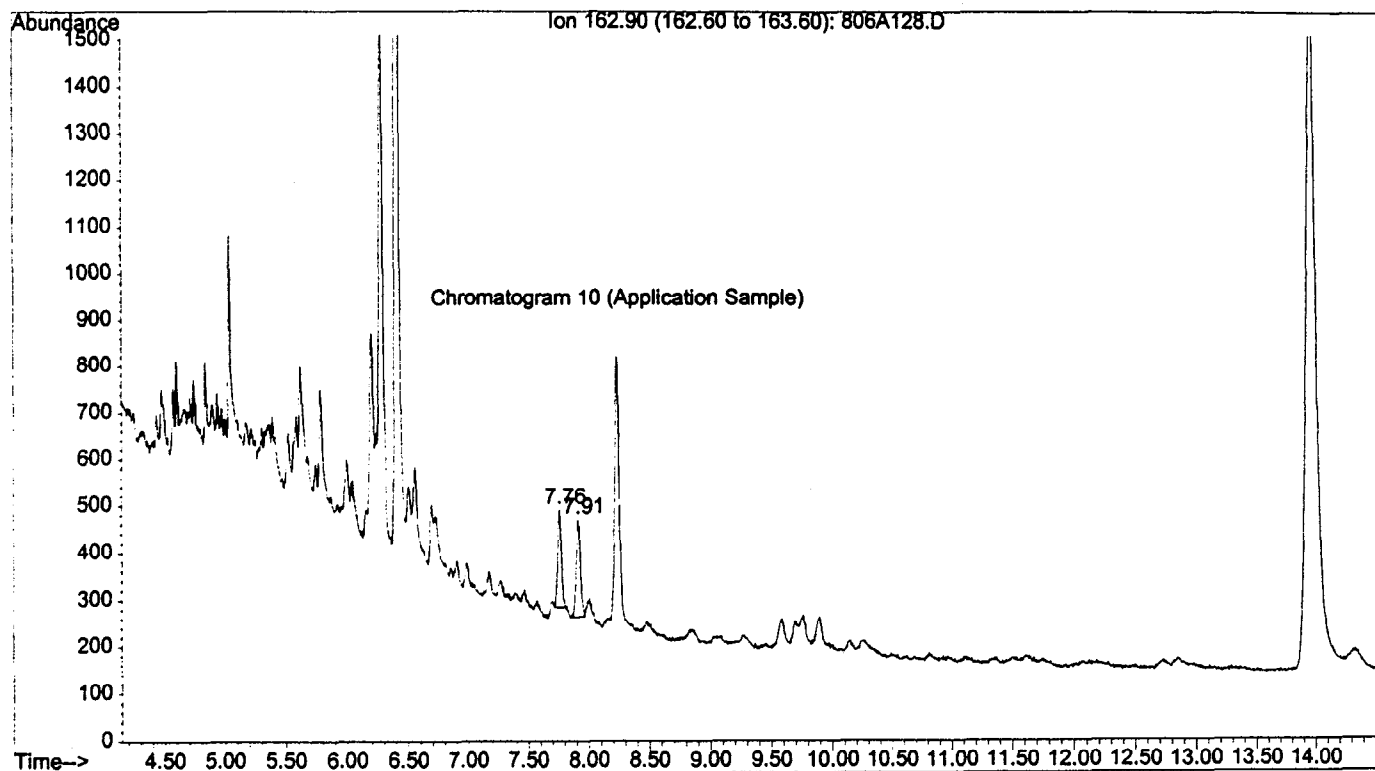
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Operator : Matt Hengel
Acquired : 20 Sep 97 1:01 pm using AcqMethod PERMETH
Instrument : GC/MS Ins
Sample Name: 296 (LS-1) 10ml 1ul inj.
Misc Info :
Vial Number: 20



File : D:\DATA\ARB97\PERMETH\092397\923A036.D
Operator : Matt Hengel
Acquired : 23 Sep 97 8:25 pm using AcqMethod PERMETH
Instrument : GC/MS Ins
Sample Name: 064S50R6 75ml 1ul inj.
Misc Info :
Vial Number: 14



File : D:\DATA\ARB97\PERMETH\080697\806A128.D
Operator : Matt Hengel
Acquired : 8 Aug 97 4:17 am using AcqMethod PERMETH
Instrument : GC/MS Ins
Sample Name: 104 PERS5D 4ml 3ul inj.
Misc Info :
Vial Number: 45



APPENDIX III
PESTICIDE USE REPORT

Att: Kevin M

916-263-2067

Listing P.U.R. Information Ordered By Permit Number and Site ID

Site ID 2PJ-3

Page: 1

Permit # 0406022

Name PAUL JACKSON

Sc	Twn	Rng	Appl Date	EPA Code	Commodity	Quantity	Amount Used
35	18N	02E	03/31/97	1812- 288-AA-	0 3009- 0	10.00 A	80.00 LB
35	18N	02E	03/31/97	1812- 251-AA-	0 3009- 0	10.00 A	580.00 OZ
35	18N	02E	03/31/97	72-50003-AA-	0 3009- 0	10.00 A	60.00 OZ
35	18N	02E	04/06/97	1812- 288-AA-	0 3009- 0	10.00 A	80.00 LB
35	18N	02E	04/06/97	1812- 251-AA-	0 3009- 0	10.00 A	580.00 OZ
35	18N	02E	04/06/97	72-50003-AA-	0 3009- 0	10.00 A	60.00 OZ
35	18N	02E	04/15/97	1812- 288-AA-	0 3009- 0	10.00 A	80.00 LB
35	18N	02E	04/15/97	1812- 251-AA-	0 3009- 0	10.00 A	580.00 OZ
35	18N	02E	04/15/97	38167-50012-AA-	0 3009- 0	10.00 A	30.00 OZ
35	18N	02E	04/22/97	1812- 288-AA-	0 3009- 0	10.00 A	80.00 LB
35	18N	02E	04/22/97	1812- 251-AA-	0 3009- 0	10.00 A	580.00 OZ
35	18N	02E	04/22/97	72-50003-AA-	0 3009- 0	10.00 A	30.00 OZ
35	18N	02E	04/28/97	1812- 288-AA-	0 3009- 0	10.00 A	80.00 LB
35	18N	02E	04/28/97	1812- 251-AA-	0 3009- 0	10.00 A	50.00 OZ
35	18N	02E	04/28/97	72-50003-AA-	0 3009- 0	10.00 A	60.00 OZ
35	18N	02E	06/19/97	10182- 18-AA-	0 3009- 0	10.00 A	1.95 GA
35	18N	02E	06/19/97	400- 427-AA-	0 3009- 0	10.00 A	70.00 LB
* 35	18N	02E	08/01/97	10182- 18-AA-	0 3009- 0	10.00 A	1.95 GA*
35	18N	02E	08/29/97	72-50006-AA-	0 3009- 0	10.00 A	40.00 OZ
35	18N	02E	08/29/97	100- 754-AA-	0 3009- 0	10.00 A	60.00 LB
35	18N	02E	08/29/97	72-50012-AA-	0 3009- 0	10.00 A	2.50 GA
35	18N	02E	11/10/97	8536- 19-AA-	0 3009- 0	7.00 U	14.00 LB

Check next page for listing of EPA and commodity names

End Of Report

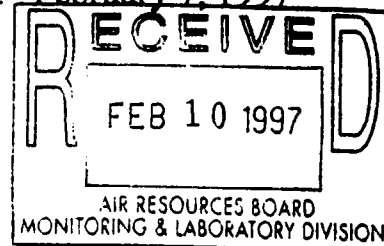
APPENDIX IV

DPR's
MONITORING RECOMMEDATIONS FOR PERMETHRIN

Memorandum

o: George Lew, Chief
Engineering and Laboratory Branch
Monitoring and Laboratory Division
Air Resources Board
600 North Market Boulevard
Sacramento, California 95812

Date: February 7, 1997



From: Department of Pesticide Regulation - 1020 N Street, Room 161
Sacramento, California 95814-5624

Subject: AIR MONITORING RECOMMENDATION FOR PERMETHRIN

Attached is the Department of Pesticide Regulation's (DPR) recommendation for monitoring the insecticide permethrin. DPR provides this recommendation pursuant to the requirements of AB 1807/3219 (Food and Agricultural Code, Division 7, Chapter 3, Article 1.5). DPR bases its air monitoring recommendations on historical permethrin use information. Therefore, we request you consult with the agricultural commissioner in the county where air monitoring will be conducted to select appropriate sites.

We anticipate submission of air monitoring data by August 1998.

If you have any questions please contact Kevin Kelley, of my staff, at (916) 324-4187.

A handwritten signature in cursive script that reads "John S. Sanders".

John S. Sanders, Chief
Environmental Monitoring and
Pest Management Branch
(916) 324-4100

Attachment



George Lew
February 7, 1997
Page 2

cc: Ted Davis, Agricultural Commissioner Kern County (w/attachment)
Daniel J. Merkley, County Agricultural Commissioner Liaison (w/attachment)
Raymond Menebroker, ARB (w/attachment)
Kevin Mongar, ARB (w/attachment)
Lynn Baker, ARB (w/attachment)
Charles M. Andrews, DPR (w/attachment)
Gary Patterson, DPR (w/attachment)
Barry Cortez, DPR (w/attachment)
John Donahue, DPR (w/attachment)
Madeline Brattesani, DPR (w/attachment)
Kevin Kelley, DPR (w/attachment)



Staff Report

**USE INFORMATION AND AIR MONITORING
RECOMMENDATION FOR THE PESTICIDE
ACTIVE INGREDIENT PERMETHRIN**

February 1997

Principal Author

Pamela Wales
Environmental Research Scientist

State of California
Department of Pesticide Regulation
1020 N Street
Sacramento, California 95814-5624

USE INFORMATION AND AIR MONITORING RECOMMENDATION FOR THE PESTICIDE ACTIVE INGREDIENT PERMETHRIN

A. BACKGROUND

This recommendation contains general information regarding the physical-chemical properties and the historical trends in the use of 3-(2,2-Dichloroethenyl)-2,2-dimethylcyclopropane-carboxylic acid (3-phenoxyphenyl) methyl ester (permethrin). The Department of Pesticide Regulation (DPR) provides this information to assist the Air Resources Board (ARB) in their selection of appropriate locations for conducting pesticide air monitoring operations.

Permethrin (CAS: 52645-53-1) exists as either colorless crystals or a light yellow viscous liquid. Technical material contains 60% *trans*- and 40% *cis*- isomers. Permethrin has a molecular formula of $C_{21}H_{20}Cl_2O_3$, a molecular weight of 391.29 g/mole, and a specific density of 0.960 at 25 °C. It has a water solubility of 0.2 mg/L at 20 °C, a Henry's Constant of 1.0×10^{-5} atm·m³/mol at 20–25 °C, and a vapor pressure of 1.88×10^{-8} mmHg at 20 °C. Permethrin is miscible with many organic solvents except ethylene glycol.

Soil microorganisms rapidly hydrolyze permethrin to 3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylic acid and 3-phenoxybenzyl alcohol. When applied at recommended rates, permethrin's soil half-life ($t_{1/2}$) is less than 38 days in soils containing 1.3 to 51.3 percent organic matter with pH ranging from 4.2-7.7. Permethrin degrades by photolysis in aqueous solutions containing various organic solvents and under UV light, or on soil in sunlight. Permethrin's photolytic decomposition results in the isomerization of the cyclopropane moiety and ester cleavage. The identified photolysis products include 3-phenoxybenzyl-dimethyl acrylate, 3-phenoxybenzaldehyde, 3-phenoxybenzoic acid, monochloro-vinyl acids, *cis*- and *trans*-dichlorovinyl acids, benzoic acid, 3-hydroxybenzoic acid, 3-hydroxybenyl alcohol, benzyl alcohol, benzaldehyde, 3-hydroxybenzaldehyde, and 3-hydroxybenzoic acid.

Permethrin's acute oral LD₅₀ is approximately 4,000 mg/kg for rats. Its LC₅₀ (48 hour) is 5.4 µg/L for rainbow trout, and 1.8 µg/L for bluegill sunfish. Based on potential reproductive considerations, permethrin entered the risk assessment process at DPR under the SB 950 (Birth Defect Prevention Act of 1984).

B. USE OF PERMETHRIN

As of January 16, 1997, 448 permethrin-containing products were registered for use in California. The currently registered permethrin products include: 1) agricultural products for the control of the larvae, adults, and eggs of chewing lepidopterous and coleopterous insect pests in a variety of crops; 2) flea collars, dips and pet sprays for the control of fleas, ticks and flies on dogs; 3) home and garden sprays and foggers; and 4) ear tags, powders, and sprays for the control of insects on cattle and other domesticated animals.

With DPR's implementation of full pesticide use reporting in 1990, all users must report the agricultural use of any pesticide to their county agricultural commissioners, who subsequently forward this information to DPR. DPR compiles and publishes the use information in the annual Pesticide Use Report (PUR). Because of California's broad definition for agricultural use, DPR includes data from pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and along roadways and railroad rights-of-way, postharvest applications of pesticides to agricultural commodities, and all pesticides used in poultry and fish production, and some livestock applications in the PUR. DPR does not collect use information for home and garden use, or for most industrial and institutional uses. The information included in this monitoring recommendation reflects widespread field applications of permethrin. Use rates were calculated by dividing the total pounds of permethrin used (where permethrin was applied to acreage) by the total number of acres treated.

Permethrin is a widely-used, non-systemic insecticide with contact and stomach action, and has a slight repellent effect. In California's agricultural setting, growers use permethrin primarily to control the larvae, adults, and eggs of chewing lepidopterous and coleopterous insect pests in a variety of crops. Additionally, users apply permethrin as a residual surface spray in mushroom houses, and livestock and poultry quarters. According to product labels, permethrin's recommended use rates range from 0.05 to 0.5 pounds of active ingredient per acre. Permethrin is formulated as either an emulsifiable concentrate, wettable powder, dustable powder, aerosol, or as granules. Permethrin-containing products include the Signal Word "Warning" on their labels. DPR registers permethrin as a restricted-use pesticide because of its toxicity to fish and aquatic organisms.

According to the PUR, nearly 80 percent of California's agricultural permethrin use occurs in ten counties (Table 1). Historically, agricultural applications account for approximately 99 percent of the total amount of permethrin reported used each year. Non-agricultural applications—landscape maintenance, structural pest control, or rights-of-way—account for less than one percent of the reported annual use.

Table 1. Annual Agricultural Use of Permethrin (Pounds of Active Ingredient)

County	1995	1994	1993
Monterey	48,191	42,103	41,133
Imperial	26,228	34,113	49,074
Ventura	10,445	6,212	26,997
Fresno	10,018	7,045	9,235
Madera	9,507	6,547	3,800
Santa Barbara	7,732	5,674	6,531
Stanislaus	6,569	8,339	5,626
Kern	5,644	7,193	6,972
Merced	4,898	4,777	4,902
Sutter	4,576	5,170	4,286
County Totals	133,808	127,173	158,556
Percent of Total	78%	74%	78%
CALIFORNIA TOTAL	170,741	171,317	202,425

In general, Monterey County reports the greatest field use of permethrin according to the PUR (Table 1). In Monterey County, the agricultural use of permethrin during September generally trended upward from 1993 to 1995; in 1995, the highest reported use in a month occurred in Monterey County in September. With the exception of 1992, agricultural applications of permethrin in Monterey County are consistently highest in September followed by August (Table 2).

Table 2. Agricultural Applications of Permethrin in Monterey County

	1995		1994		1993	
	Lbs Used ¹	Rate ²	Lbs Used ¹	Rate ²	Lbs Used ¹	Rate ²
Monterey						
September	8,381	0.14	7,165	0.14	7,487	0.14
August	7,888	0.14	5,063	0.13	6,162	0.13

¹ In pounds of active ingredient.

² Average rate (in pounds of active ingredient per acre).

In an agricultural setting, growers use permethrin primarily to control chewing lepidopterous and coleopterous insect pests. They use permethrin to control the navel orange worm in almonds, peaches, pistachios, and walnuts. Growers apply permethrin to control ants in almonds and pistachios, oriental fruit moth in almonds and peaches, peach twig borer in almonds, peaches and pistachios, and codling moth in walnuts. Additionally, they use permethrin to control lygus bugs, earworms, cutworms, and other pests. Table 3 shows the average monthly rates of reported permethrin use on the crops with the consistently highest rates of use.

Table 3. Average Monthly Rates of Permethrin Use in Three Counties on Crops with the Consistently Highest Rates of Use.

County	Month	Crop	Average Rate ¹
Butte	May	Walnuts	0.31-0.36
Madera	April-May	Pistachios	0.23-0.28
Butte	June, July, August	Peaches	0.25-0.47
Kern	April	Pistachios	0.24-0.43

¹ In pounds active ingredient per acre.

C. RECOMMENDATIONS

1. *Ambient Air Monitoring*

The historical trends in permethrin use suggest that monitoring should occur over a 30- to 45-day sampling period in Monterey County from late August through the end of September. Three to five sampling sites should be selected in relatively high-population areas or in areas frequented by people. Sampling sites should be located near lettuce and celery growing areas. Ambient samples should not be collected from samplers immediately adjacent to fields or orchards where permethrin is being applied. At each site, twenty to thirty discrete 24-hour samples should be taken during the sampling period. Background samples should be collected in an area distant to permethrin applications.

Replicate (collocated) samples are needed for five dates at each sampling location. Two collocated samplers (in addition to the primary sampler) should be run on those days. The date chosen for replicate samples should be distributed over the entire sampling period. They may, but need not be, the same dates at every site. Field blank and spike samples should be collected at the

same environmental conditions (e.g., temperature, humidity, exposure to sunlight) and experimental conditions (e.g., air flow rates) as those occurring at the time of ambient sampling.

2. *Application-Site Air Monitoring*

The historical trends in permethrin use (Table 3) suggest that application-site air monitoring should be conducted during one of four periods during the year, when application rates are at their highest. Monitoring may be conducted in either: 1) Butte County during May associated with applications to walnuts; 2) Butte County during June, July, or August associated with applications to peaches; 3) Madera County in April or May in association with application to pistachios; or 4) Kern County in April associated with application to pistachios. In any case, monitoring should be related to applications at the highest rates of 0.30 pounds permethrin per acre or greater. Permethrin is extensively applied during these periods so care should be taken so that nearby applications do not contaminate collected samples. A three day monitoring period should be established with sampling times as follows: application + 1 hour, followed by one 2-hour sample, one 4-hour sample, two 8-hour samples and two 24-hour samples. A minimum of four samplers should be positioned, one on each side of the field. A fifth sampler should be collocated at one position. Since permethrin is extensively used in the area, background samples should collect enough volume (either 12 hours at 15 liters/min, or a shorter period with a higher volume pump) to permit a reasonable minimum detection level. Ideally, samplers should be placed a minimum of 20 meters from the field. Field blank and field spike samples should be collected at the same environmental (temperature humidity, exposure to sunlight) and experimental (similar air flow rates) conditions as those occurring at the time of sampling.

Additionally, we request that you provide in the monitoring report: 1) an accurate record of the positions of the monitoring equipment with respect to the field, including the exact distance that the sampler is positioned from the field; 2) an accurate drawing of the monitoring site showing the precise location of the meteorological equipment, trees, buildings, and other obstacles; 3) meteorological data collected at a minimum of 15-minute intervals including wind speed and direction, humidity, air temperature, and comments regarding degree of cloud cover; and 4) the elevation of each sampling station with respect to the field, and the orientation of the field with respect to North (identified as either true or magnetic North).

APPENDIX V

APPLICATION AND AMBIENT FIELD LOG SHEETS

LOG BOOK
Project: Permethrin Application Butte Co.
Project #: C97-041

Log Number	Sample ID	Date	Time	Comments	weather o = overcast pc = partly cloudy k = clear	taken by
1	PERBW	7-31	1155	#25	←	KIA
		8-1	0700			
2	FS1W	7-31	1155	#3		
		8-1	0700			
3	PERBS	7-31	1152			
		8-1	0725			
4	FS2S	7-31	1152			
		8-1	0725			
5	PERBN	7-31	1209			
		8-1	0715			
6	FS3N	7-31	1209			
		8-1	0715			
7	PERBE	7-31	1200	NONE NOT USED		
		8-1	0720			
8	FS4E	7-31	1200			
		8-1	0720			
9	PERTSI	7-31	1045			
		8-1				
10	TS2	7-31	1045			
11	TS3	7-31	1045			
12	TS4	7-31	1045			
13	PERTB	7-31	1045			
14	PERWI	8-1	0700			
		8-1	1220			
15	PERNI	8-1	0715			
		8-1	1200			
16	PEREI	8-1	0720			
		8-1	1210			
17	PERSI	8-1	0725			
		8-1	1225			
18	PERSID	8-1	0725			
		8-1	1225			
19	PERN2	8-1	1200			
		8-1	1445	1500		
20	PEREZ	8-1	1210			
		8-1	1445			
21	PERW2	8-1	1220			
		8-1	1434			
22	PERS2	8-1	1225	1439		
		8-1	1439			

LOG BOOK

Project: Permethrin Application Butte Co.

Project #: C97-041

Log Number	Sample ID	Date	Time	Comments	weather o = overcast pc = partly cloudy k = clear taken by	
✓ 23	PERS2D	8-1	1225	pump wts of t	K	MA
		8-1	0239			
✓ 24	PERW2	8/1	2:34			
		8/1	1915			
✓ 25	PERS3	7/1	14:8			
		8/1	1935			
✓ 26	PER31D	8/1	1438			
		8-1	1935			
✓ 27	PERE3	8/1	1445			
		8-1	1920			
✓ 28	PERN3	8/1	1600			
		8-1	1910			
✓ 29	PERW4	8-1	1915			
		8-2	0535			
✓ 30	PER54	8-1	1935			
		8-2	0530			
✓ 31	PERS4D	8-1	1935			
		8-2	0530			
✓ 32	PERE4	8-1	1920			
		8-2	0515			
✓ 33	PERN4	8-1	1910			
		8-2	0510			
✓ 34	PERW5	8-2	0535			
		8-3	0630			
✓ 35	PERS5	8-2	0530			
		8-3	0555			
✓ 36	PERS5D	8-2	0530	broken pump changed		
		8-3	0558	all 2200		
✓ 37	PERE5	8-2	0515			
		8-3	0545			
✓ 38	PERN5	8-2	0510			
		8-3	0545			
✓ 39	PERN6	8/3	0545			
		8/4	0510			
✓ 40	PERN6	8/3	0600			
		8/4	0505			
✓ 41	PERE6	8/3	0545			
		8-4	0500			
✓ 42	PER56	8/3	0555			
		8-4	0457			
✓ 43	PERS6D	8/3	0555			
		8/4	0457			
44		8/5/97		Lab Spikes		

45

46

47

"

"

"

GPS = Gonzalez police Station

CHS = Chualar School

SUS = Spreckles Union School District

CAS = Castroville High

MON = Monterey ACD

LOG BOOK

Project: Permethrin Ambient Monterey Co.

Project #: C97-041

Log Number	Sample ID	Date	Time	Comments	weather o = overcast pc = partly cloudy k = clear	taken by
1	GPS1	8-12	0920	Primary #20 + 49	o	MSA
		8-13	1000			
2	CHS1	8-12	1020	#25 + #3		
		8-13	1020			
3	SUS1	8-12	1125	#24 + #6		
		8-13	1045			
4	CAS1	8-12	1320	#11 + 22		
		8-13	1205			
5	MON1	8-12	1355	#21 28		
		8-13	1130			
6	GPS2	8-13	1000		o	MSA
		8-14	0930			
7	GPS2D	8-13	1000		k	
		8-14	0930			
8	CHS2	8-13	1020		k	
		8-14	0950			
9	CHS2D	8-13	1020		k	
		8-14	0950			
10	SUS2	8-13	1045		k	
		8-14	1010			
11	SUS2D	8-13	1045		k	
		8-14	1010			
12	MON2	8-13	1130		k	
		8-14	1135			
13	MON2D	8-13	1130		k	
		8-14	1135			
14	CAS2	8-13	1205		o	
		8-14	1115			
15	CAS2D	8-13	1205		o	
		8-14	1115			
16	GPS3	8-14	0930		o	
		8-15	0930			
17	CHS3	8-14	0950		o	
		8-15	0955			
18	SUS3	8-14	1010		k	
		8-15	1020			
19	MON3	8-14	1135		k	
		8-15	1045			
20	CAS3	8-14	1115		k	
		8-15	1130			
21	GPS4	8-15	0930		k	
		8-16	0915			
22	CHS4	8-15	0955		k	
		8-16	0940			

LOG BOOK

Project: Permethrin Ambient Monterey Co.

Project #: C97-041

Log Number	Sample ID	Date	Time	Comments	weather o = overcast pc = partly cloudy k = clear taken by	
23	SUS4	8-15	1020		o	MAY
		8-16	1010			
24	CAS4	8-15	1130			1
		8-16	1125			
25	GPS5	8-16	0915			
		8-17	0900			
26	CHS5	8-16	0940			
		8-17	0930			
27	SUS5	8-16	1010			
		8-17	1000			
28	CAS5	8-16	1125			
		8-17	1100			
29	GPS6	8-17	0900			
		8-18	0855			
30	CHS6	8-17	0930			
		8-18	0920			
31	SUS6	8-17	1000			
		8-18	1010			
32	CAS6	8-17	1100			
		8-18	1125			
33	GPS7	8-18	0855			
		8-19	1000			
34	CHS7	8-18	0920			
		8-19	1025			
35	SUS7	8-18	1010			
		8-19	1105			
36	MON7	8-18	1100			
		8-19	1140			
37	CAS7	8-18	1125			
		8-19	1220			
38	GPS8	8-19	1000			
		8-20	0855			
39	GPS8D	8-19	1000			
		8-20	0855			
40	CHS8	8-19	1025			
		8-20	0925			
41	CHS8D	8-19	1025			
		8-20	0925			
42	SUS8	8-19	1105			
		8-20	0950			
43	SUS8D	8-19	1105			
		8-20	0950			
44	MON8	8-19	1140			
		8-20	1015			

Log of overcast in AM
(H) Clear PM

LOG BOOK

Project: Permethrin Ambient Monterey Co.

Project #: C97-041

Log Number	Sample ID	Date	Time	Comments	weather o = overcast pc = partly cloudy k = clear taken by
45	MON8D	8-19	1140		
		8-20	1015		
46	CAS8	8-19	1220		
		8-20	1100		
47	CAS8D	8-19	1220		
		8-20	1100		
48	GPS9	8-20	0855		
		8-21	0720		
49	CHS9	8-20	0925		
		8-21	0740		
50	SUS9	8-20	0950		
		8-21	0805		
51	MON9	8-20	1015		
		8-21	0840		
52	CAS9	8-20	1000		
		8-21	0915		
53	GPS10	8-25	0945		
		8-26	1100		
54	CHS10	8-25	1025		
		8-26	1125		
55	SUS10	8-25	1105		
		8-26	1030		
56	MON10	8-25	1135		
		8-26	1000		
57	CAS10	8-25	1210		
		8-26	0920		
58	CAS11	8-26	0920		
		8-27	0850		
59	GPS11	8-26	1100		
		8-27	1030		
60	CHS11	8-26	1125		
		8-27	1050		
61	SUS11	8-26	1030		
		8-27	0955		
62	MON11	8-26	1000		
		8-27	0925		
63	CAS12	8-27	0850		
		8-28	1005		
64	CAS12D	8-27	0850		
		8-28	1005		
65	MON12	8-27	0925		
		8-28	1050		
66	MON12D	8-27	0925		
		8-28	1050		

Overcast AM
Clear PM

LOG BOOK

Project: Permethrin Ambient Monterey Co.

Project #: C97-041

Log Number	Sample ID	Date	Time	Comments	weather o = overcast pc = partly cloudy k = clear taken by
79	CAS 14	9-2-97	0930	(Overcast 9-2-97)	KEL
		9-3-97	0930		
		9-2-97	1015		
80	MON 14	9-3-97	1000		
		9-2-97	1035		
81	SUS 14	9-3-97	1030		
		9-2-97	1040		
82	GPS 14	9-3-97	1107		
		9-2-97	1100		
83	CHS 14	9-3-97	1115		
		9-3-97	0930	↓	
84	CAS 15	9-4-97	0950		
		9-3-97	1000		
85	MON 15	9-4-97	1040		
		9-3-97	1030		
86	SUS 15	9-4-97	1105		
		9-3-97	1107		
87	GPS 15	9-4-97	1140		
		9-3-97	1115		
88	CHS 15	9-4-97	1150		
		9-3-97	0930		
89	CAS 150	9-4-97	0950		
		9-3-97	1000		
90	MON 150	9-4-97	1040		
		9-3-97	1030		
91	SUS 150	9-4-97	1105		
		9-3-97	1107		
92	GPS 150	9-4-97	1140		
		9-3-97	1115		
93	CHS 150	9-4-97	1150		
		9-4-97	0956		
94	CAS 16	9-5-97	1110		
		9-4-97	1040		
95	MON 16	9-5-97	0915		
		9-4-97	1105		
96	SUS 16	9-5-97	0940		
		9-4-97	1140		
97	GPS 16	9-5-97	1000		
		9-4-97	1150		
98	CHS 16	9-5-97	1020		
		9-5-97	1115		
99	FB-16	9-5-97	1115		

LOG BOOK

Project: Permethrin Ambient Monterey Co.
Project #: C97-041

Log Number	Sample ID	Date	Time	Comments	weather o = overcast pc = partly cloudy k = clear taken by	
100	GPS17	9-8	12:50		K	BET
		9-9	12:10			
101	CHS17	9-8	12:05	1:05		
		9-9	12:40			
102	SUS17	9-8	1:45			
		9-9	11:45			
103	MON17	9-8	2:10			
		9-9	11:20			
104	CAS17	9-8	2:40			
		9-9	10:45		✓	✓
		9-9	10:45			
105	CAS18	9-10	10:00		K	BET
		9-9	11:20			
106	MON18	9-10	10:35			
		9-9	11:45			
107	SUS18	9-10	11:00			
		9-9	12:10			
108	GPS18	9-10	11:30			
		9-9	12:40			
109	CHS18	9-10	11:45		✓	✓
		9-10	10:50			
110	CAS19	9-11	8:45	overcast on	K	BET
		9-10	10:50			
111	CAS19D	9-11	8:45	recovery		
		9-11	8:45			
112	MON19	9-10	10:35			
		9-11	9:15			
113	MON19D	9-10	10:35			
		9-11	9:15			
114	SUS19	9-10	11:00			
		9-11	9:40			
115	SUS19A	9-10	11:00			
		9-11	9:40			
116	GPS19	9-10	11:30			
		9-11	10:10			
117	GPS19A	9-10	11:30			
		9-11	10:10			
118	CHS19	9-10	11:45		✓	✓
		9-11	10:37			
119	CAS20	9-11	8:45		O	BET
		9-10	9:35			
120	MON20	9-11	9:15	overcast on		
		9-12	10:05			
121	SUS20	9-11	9:46	recovery		
		9-12	10:25			

Project: Permethrin Ambient Monterey Co.
Project #: C97-041

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LOG BOOK

Project: Permethrin Ambient Monterey Co.
Project #: C97-041

Log Number	Sample ID	Date	Time	Comments	weather o = overcast pc = partly cloudy k = clear taken by	
126	GPS21	9-15	11:25		K	BET
		9-16	12:40			
127	CHS21	9-15	11:43			
		9-16	1:00			
128	SUS21	9-15	12:02			
		9-16	12:07			
129	MON21	9-15	12:55			
		9-16	11:26			
130	CAS21	9-15	12:52		✓	✓
			10:42			
131	CAS22	9-16	10:42		K	BET
		9-17	10:02			
132	MON22	9-16	11:26			
133	SUS22	9-16				
134	GPS22	9-16				
135	CHS22	9-16			✓	✓
136	FS1	9-16	11:30	R # 3		
		9-17	10:37			
137	FS2	9-16	11:30	(R) Rotometer # 21		
		9-17	10:37			
138	FS3	9-16	11:30	R # 28		
		9-17	10:37			
139	SUS22	9-16	12:07			
		9-17	11:15			
140	GPS22	9-16	12:40			
		9-17	11:45			
141	CHS22	9-16	12:00			
		9-17	12:10			
142	CAS23	9-17	10:02		O	BET
		9-18	9:15			
143	CAS23D	9-17	10:02			
		9-18	9:15			
144	MON23	9-17	10:40			
		9-18	9:51			
145	MON23D	9-17	10:40			
		9-18	9:51			
146	SUS23	9-17	11:15			
		9-18	11:20			
147	SUS23D	9-17	11:15		✓	✓
		9-18	10:20			

APPENDIX VI

PERMETHRIN APPLICATION METEOROLOGICAL DATA

1-hour Resultant Average Wind Speed (mph) and Direction for Gridley (AIRS ID #060074001)

Begin Hour (PST)	Date and Parameter									
	970731 Speed	970801 Speed	970802 Speed	970803 Speed	970804 Speed	970731 Direction	970801 Direction	970802 Direction	970803 Direction	970804 Direction
0	3.45	3.45	1.15	1.15	2.30	145	139	215	108	169
1	3.45	2.30	1.15	2.30	2.30	162	150	165	124	80
2	2.30	2.30	3.45	3.45	1.15	157	173	113	141	175
3	2.30	2.30	2.30	3.45	1.15	104	164	117	181	167
4	2.30	2.30	2.30	2.30	0.00	99	62	188	132	278
5	1.15	2.30	2.30	2.30	1.15	38	82	155	85	75
6	2.30	2.30	1.15	2.30	1.15	163	90	181	97	99
7	5.76	3.45	3.45	1.15	2.30	158	139	222	136	329
8	4.60	4.60	2.30	1.15	3.45	151	148	244	197	309
9	3.45	3.45	3.45	2.30	3.45	159	187	309	286	311
10	3.45	3.45	3.45	4.60	4.60	143	185	296	292	281
11	4.60	5.76	2.30	4.60	4.60	141	147	280	297	274
12	3.45	6.91	1.15	2.30	5.76	162	148	304	263	278
13	4.60	5.76	1.15	2.30	4.60	139	144	285	228	287
14	5.76	5.76	1.15	2.30	3.45	136	142	207	247	297
15	6.91	5.76	3.45	2.30	2.30	139	149	208	176	309
16	5.76	6.91	3.45	4.60	2.30	142	144	169	147	298
17	5.76	4.60	4.60	3.45	2.30	147	130	135	138	24
18	4.60	3.45	3.45	2.30	1.15	137	131	116	154	42
19	2.30	4.60	3.45	2.30	1.15	152	145	141	135	50
20	3.45	3.45	3.45	2.30	0.00	157	148	156	137	73
21	4.60	3.45	3.45	4.60	2.30	121	138	114	108	82
22	5.76	4.60	3.45	4.60	2.30	143	142	110	114	66
23	3.45	3.45	2.30	2.30	2.30	165	154	19	129	101

C:\LynnBaker\gridley.wb1

PERMETHRIN APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Julian Date	Time	Temp. (F)	Barometric Pressure (hPa)	Relative Humidity (%)
1997	212	1129	82.0	1012	56.5
1997	212	1144	81.0	1012	58.4
1997	212	1159	80.7	1012	58.7
1997	212	1214	81.8	1012	57.6
1997	212	1229	83.1	1012	55.8
1997	212	1244	84.0	1012	55.4
1997	212	1259	84.3	1012	55.4
1997	212	1314	85.2	1012	54.5
1997	212	1329	86.3	1012	53.2
1997	212	1344	88.0	1012	49.7
1997	212	1359	87.7	1011	50.7
1997	212	1414	89.7	1011	49.8
1997	212	1429	90.0	1011	48.3
1997	212	1444	91.0	1011	47.7
1997	212	1459	92.1	1011	44.3
1997	212	1514	92.4	1010	44.3
1997	212	1529	94.2	1010	44.9
1997	212	1544	93.7	1010	45.7
1997	212	1559	93.5	1010	46.3
1997	212	1614	93.8	1010	45.7
1997	212	1629	94.5	1010	43.9
1997	212	1644	94.5	1010	37.9
1997	212	1659	94.1	1009	35.4
1997	212	1714	94.4	1009	32.7
1997	212	1729	94.1	1009	29.0
1997	212	1744	94.2	1009	28.2
1997	212	1759	94.5	1009	28.4
1997	212	1814	94.5	1009	29.7
1997	212	1829	93.6	1009	32.0
1997	212	1844	93.0	1009	33.7
1997	212	1859	92.0	1008	37.4
1997	212	1914	91.2	1008	41.3
1997	212	1929	89.7	1008	46.3
1997	212	1944	88.3	1008	53.6
1997	212	1959	85.6	1008	60.7
1997	212	2014	80.2	1008	67.3
1997	212	2029	76.2	1008	70.6
1997	212	2044	74.2	1008	72.5
1997	212	2059	73.1	1008	71.1
1997	212	2114	71.4	1008	79.9
1997	212	2129	70.0	1009	82.1
1997	212	2144	69.6	1009	79.8

PERMETHRIN APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Julian Date	Time	Temp. (F)	Barometric Pressure (hPa)	Relative Humidity (%)
1997	212	2159	69.3	1009	79.1
1997	212	2214	69.7	1009	75.3
1997	212	2229	70.5	1009	70.0
1997	212	2244	71.1	1009	69.2
1997	212	2259	71.1	1009	68.1
1997	212	2314	71.3	1009	68.1
1997	212	2329	71.5	1010	66.5
1997	212	2344	71.9	1010	64.2
1997	212	2359	71.6	1010	63.8
1997	213	14	70.4	1010	65.9
1997	213	29	69.2	1010	67.7
1997	213	44	67.8	1010	70.2
1997	213	59	67.2	1010	71.7
1997	213	114	66.2	1010	74.0
1997	213	129	65.8	1010	75.0
1997	213	144	66.3	1010	72.7
1997	213	159	66.4	1010	72.1
1997	213	214	66.4	1010	71.3
1997	213	229	65.4	1010	73.1
1997	213	244	64.8	1010	74.0
1997	213	259	63.9	1010	76.3
1997	213	314	63.1	1010	78.5
1997	213	329	61.6	1010	82.5
1997	213	344	60.8	1010	83.5
1997	213	359	60.3	1010	85.3
1997	213	414	59.9	1010	84.6
1997	213	429	61.4	1010	80.2
1997	213	444	62.2	1010	77.4
1997	213	459	62.9	1010	76.4
1997	213	514	62.1	1010	78.6
1997	213	529	61.7	1010	79.7
1997	213	544	61.8	1010	80.1
1997	213	559	60.4	1010	83.1
1997	213	614	59.8	1011	85.2
1997	213	629	59.7	1011	86.5
1997	213	644	60.0	1011	87.3
1997	213	659	60.1	1011	89.3
1997	213	714	60.2	1011	88.6
1997	213	729	61.2	1011	87.9
1997	213	744	61.3	1011	88.3
1997	213	759	63.2	1011	88.2
1997	213	814	66.4	1012	84.8

PERMETHRIN APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Julian Date	Time	Temp. (F)	Barometric Pressure (hPa)	Relative Humidity (%)
1997	213	829	69.4	1012	75.5
1997	213	844	71.3	1012	70.6
1997	213	859	71.2	1012	72.7
1997	213	914	73.4	1012	68.5
1997	213	929	75.3	1012	64.1
1997	213	944	75.7	1012	63.7
1997	213	959	77.3	1012	61.7
1997	213	1014	78.8	1012	59.9
1997	213	1029	79.8	1012	58.6
1997	213	1044	79.2	1012	55.7
1997	213	1059	80.5	1012	52.5
1997	213	1114	82.0	1012	52.7
1997	213	1129	82.9	1012	51.9
1997	213	1144	84.2	1012	45.6
1997	213	1159	85.3	1012	42.9
1997	213	1214	86.2	1012	45.3
1997	213	1229	87.9	1012	44.6
1997	213	1244	87.6	1011	46.9
1997	213	1259	88.4	1011	47.6
1997	213	1314	88.9	1011	45.5
1997	213	1329	90.4	1011	43.5
1997	213	1344	91.2	1011	42.7
1997	213	1359	91.4	1011	40.8
1997	213	1414	92.4	1011	39.8
1997	213	1429	93.3	1011	38.9
1997	213	1444	94.5	1010	37.6
1997	213	1459	92.4	1010	38.2
1997	213	1514	92.2	1010	39.0
1997	213	1529	93.7	1010	38.9
1997	213	1544	93.1	1010	38.4
1997	213	1559	93.6	1010	37.2
1997	213	1614	93.7	1010	33.7
1997	213	1629	93.7	1009	32.0
1997	213	1644	94.7	1009	29.0
1997	213	1659	95.0	1009	25.7
1997	213	1714	95.6	1009	26.4
1997	213	1729	95.4	1009	27.3
1997	213	1744	96.3	1009	27.7
1997	213	1759	94.8	1009	28.7
1997	213	1814	93.8	1009	28.3
1997	213	1829	93.4	1008	26.7
1997	213	1844	92.9	1008	28.3

PERMETHRIN APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Julian Date	Time	Temp. (F)	Barometric Pressure (hPa)	Relative Humidity (%)
1997	213	1859	92.4	1008	32.8
1997	213	1914	90.9	1008	36.7
1997	213	1929	89.4	1008	33.2
1997	213	1944	87.5	1008	34.4
1997	213	1959	84.0	1008	41.4
1997	213	2014	81.0	1008	45.6
1997	213	2029	76.6	1008	55.6
1997	213	2044	73.1	1008	64.3
1997	213	2059	71.5	1008	67.8
1997	213	2114	70.1	1008	68.8
1997	213	2129	69.5	1008	67.3
1997	213	2144	69.0	1008	66.9
1997	213	2159	68.9	1009	67.4
1997	213	2214	67.6	1009	70.1
1997	213	2229	67.2	1009	70.4
1997	213	2244	68.6	1009	69.5
1997	213	2259	70.4	1009	64.9
1997	213	2314	70.5	1009	62.0
1997	213	2329	70.2	1009	63.0
1997	213	2344	69.8	1009	64.9
1997	213	2359	68.4	1009	64.4
1997	214	14	66.7	1009	67.4
1997	214	29	64.6	1009	72.3
1997	214	44	63.8	1009	70.2
1997	214	59	63.9	1009	69.1
1997	214	114	63.4	1009	70.7
1997	214	129	63.3	1009	70.2
1997	214	144	63.3	1009	69.1
1997	214	159	63.3	1009	68.5
1997	214	214	63.0	1009	69.2
1997	214	229	63.2	1009	69.7
1997	214	244	61.9	1009	71.1
1997	214	259	61.3	1009	72.3
1997	214	314	61.3	1010	71.9
1997	214	329	61.7	1010	70.4
1997	214	344	61.8	1010	70.0
1997	214	359	60.9	1010	72.7
1997	214	414	58.7	1010	78.1
1997	214	429	57.7	1010	80.1
1997	214	444	56.8	1010	83.2
1997	214	459	56.1	1010	86.9
1997	214	514	55.9	1010	87.8

PERMETHRIN APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Julian Date	Time	Temp. (F)	Barometric Pressure (hPa)	Relative Humidity (%)
1997	214	529	55.5	1010	86.6
1997	214	544	55.4	1010	86.4
1997	214	559	55.0	1010	87.2
1997	214	614	55.0	1010	88.6
1997	214	629	54.8	1010	88.8
1997	214	644	55.6	1010	86.3
1997	214	659	56.0	1011	86.3
1997	214	714	57.5	1011	84.1
1997	214	729	59.7	1011	81.1
1997	214	744	64.4	1011	76.2
1997	214	759	67.0	1011	72.7
1997	214	814	68.0	1011	74.2
1997	214	829	68.9	1011	75.3
1997	214	844	69.6	1011	74.2
1997	214	859	70.8	1012	73.6
1997	214	914	71.4	1012	73.1
1997	214	929	73.1	1011	68.9
1997	214	944	74.9	1011	67.1
1997	214	959	76.6	1011	62.4
1997	214	1014	78.2	1011	54.0
1997	214	1029	79.7	1011	43.2
1997	214	1044	80.0	1011	47.8
1997	214	1059	80.6	1011	49.4
1997	214	1114	81.0	1011	50.9
1997	214	1129	82.3	1011	53.3
1997	214	1144	82.7	1011	52.1
1997	214	1159	83.2	1011	51.9
1997	214	1214	83.8	1011	47.7
1997	214	1229	84.5	1011	39.3
1997	214	1244	85.0	1011	39.9
1997	214	1259	86.0	1011	39.8
1997	214	1314	87.5	1010	38.5
1997	214	1329	88.1	1010	39.3
1997	214	1344	89.2	1010	38.2
1997	214	1359	90.3	1010	37.3
1997	214	1414	91.0	1010	36.4
1997	214	1429	91.4	1009	35.6
1997	214	1444	91.6	1009	34.7
1997	214	1459	93.1	1009	35.0
1997	214	1514	93.2	1009	35.7
1997	214	1529	93.2	1008	37.1
1997	214	1544	94.1	1008	36.8

PERMETHRIN APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Julian Date	Time	Temp. (F)	Barometric Pressure (hPa)	Relative Humidity (%)
1997	214	1559	94.5	1008	36.7
1997	214	1614	93.6	1008	36.7
1997	214	1629	94.6	1008	36.0
1997	214	1644	95.0	1008	35.4
1997	214	1659	96.0	1008	32.6
1997	214	1714	95.8	1007	30.1
1997	214	1729	96.4	1007	30.8
1997	214	1744	96.7	1007	30.2
1997	214	1759	97.1	1007	28.0
1997	214	1814	98.0	1007	27.6
1997	214	1829	97.2	1007	22.2
1997	214	1844	97.3	1007	24.8
1997	214	1859	95.5	1006	26.2
1997	214	1914	93.4	1006	29.0
1997	214	1929	91.3	1006	31.8
1997	214	1944	89.1	1006	36.7
1997	214	1959	85.9	1006	41.9
1997	214	2014	82.2	1006	50.3
1997	214	2029	78.1	1006	59.9
1997	214	2044	75.7	1006	63.5
1997	214	2059	73.9	1006	66.4
1997	214	2114	72.6	1006	68.0
1997	214	2129	71.1	1007	70.8
1997	214	2144	71.0	1007	64.7
1997	214	2159	71.1	1007	61.6
1997	214	2214	71.4	1007	58.1
1997	214	2229	70.6	1007	60.3
1997	214	2244	71.1	1007	60.9
1997	214	2259	71.7	1007	59.0
1997	214	2314	71.9	1007	58.4
1997	214	2329	70.7	1007	60.3
1997	214	2344	69.0	1007	63.0
1997	214	2359	68.3	1007	60.2
1997	215	14	66.8	1007	62.9
1997	215	29	67.1	1007	59.7
1997	215	44	66.5	1007	60.5
1997	215	59	65.2	1007	63.2
1997	215	114	64.0	1007	65.3
1997	215	129	64.8	1007	61.7
1997	215	144	64.1	1007	64.1
1997	215	159	63.0	1007	63.7
1997	215	214	62.7	1007	64.0

PERMETHRIN APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Julian Date	Time	Temp. (F)	Barometric Pressure (hPa)	Relative Humidity (%)
1997	215	229	62.2	1007	65.3
1997	215	244	61.8	1007	68.0
1997	215	259	60.9	1007	73.2
1997	215	314	60.2	1007	75.8
1997	215	329	60.5	1007	76.2
1997	215	344	59.7	1007	78.1
1997	215	359	59.3	1007	76.8
1997	215	414	59.6	1007	76.4
1997	215	429	59.5	1007	76.9
1997	215	444	59.4	1007	77.9
1997	215	459	59.6	1007	77.0
1997	215	514	59.6	1007	77.8
1997	215	529	59.6	1007	77.8
1997	215	544	58.8	1008	80.2
1997	215	559	58.5	1008	80.1
1997	215	614	58.3	1008	81.8
1997	215	629	57.9	1008	85.2
1997	215	644	58.0	1008	84.8
1997	215	659	59.1	1008	83.2
1997	215	714	60.6	1009	81.7
1997	215	729	62.5	1009	80.3
1997	215	744	65.5	1009	77.8
1997	215	759	70.3	1009	69.9
1997	215	814	72.1	1009	65.3
1997	215	829	74.5	1009	63.9
1997	215	844	75.0	1009	62.6
1997	215	859	75.8	1009	62.2
1997	215	914	76.2	1009	58.8
1997	215	929	77.7	1009	58.2
1997	215	944	80.0	1009	55.0
1997	215	959	83.7	1009	48.7
1997	215	1014	83.8	1009	46.7
1997	215	1029	83.6	1009	38.9
1997	215	1044	84.4	1009	41.2
1997	215	1059	85.1	1009	44.3
1997	215	1114	84.9	1009	45.6
1997	215	1129	84.7	1009	48.0
1997	215	1144	85.1	1009	52.3
1997	215	1159	85.9	1009	53.3
1997	215	1214	86.5	1009	46.4
1997	215	1229	87.2	1009	44.1
1997	215	1244	89.3	1009	44.3

PERMETHRIN APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Julian Date	Time	Temp. (F)	Barometric Pressure (hPa)	Relative Humidity (%)
1997	215	1259	89.4	1009	39.3
1997	215	1314	91.3	1009	42.3
1997	215	1329	92.1	1009	41.6
1997	215	1344	92.9	1009	39.5
1997	215	1359	94.0	1009	37.2
1997	215	1414	94.5	1008	42.3
1997	215	1429	94.4	1008	40.3
1997	215	1444	95.4	1008	39.6
1997	215	1459	95.6	1008	38.8
1997	215	1514	96.8	1008	38.9
1997	215	1529	98.1	1008	33.6
1997	215	1544	98.3	1007	36.9
1997	215	1559	97.9	1007	37.0
1997	215	1614	98.6	1007	36.5
1997	215	1629	97.5	1007	38.4
1997	215	1644	99.5	1007	36.4
1997	215	1659	100.1	1007	32.8
1997	215	1714	100.2	1007	27.6
1997	215	1729	101.1	1007	22.5
1997	215	1744	101.6	1006	23.2
1997	215	1759	100.9	1006	25.7
1997	215	1814	100.5	1006	26.1
1997	215	1829	99.3	1006	27.8
1997	215	1844	99.3	1006	32.9
1997	215	1859	97.1	1006	37.1
1997	215	1914	96.2	1006	43.7
1997	215	1929	93.8	1006	53.2
1997	215	1944	91.3	1006	54.5
1997	215	1959	87.6	1006	55.8
1997	215	2014	83.2	1006	57.9
1997	215	2029	79.5	1006	63.2
1997	215	2044	77.2	1006	65.6
1997	215	2059	76.4	1006	64.4
1997	215	2114	74.9	1007	69.0
1997	215	2129	74.2	1007	68.5
1997	215	2144	73.2	1007	70.2
1997	215	2159	73.0	1007	69.5
1997	215	2214	72.0	1007	71.8
1997	215	2229	71.6	1007	75.9
1997	215	2244	72.1	1007	74.7
1997	215	2259	72.0	1007	74.3
1997	215	2314	71.4	1007	72.9

PERMETHRIN APPLICATION METEOROLOGICAL DATA (15 min. averages)

Year	Julian Date	Time	Temp. (F)	Barometric Pressure (hPa)	Relative Humidity (%)
1997	215	2329	71.3	1007	70.3
1997	215	2344	71.6	1007	68.7
1997	215	2359	71.5	1007	66.7
1997	216	14	71.8	1007	59.6
1997	216	29	71.6	1008	61.2
1997	216	44	70.5	1008	71.8
1997	216	59	70.5	1008	71.5
1997	216	114	70.2	1008	71.4
1997	216	129	67.9	1008	75.2
1997	216	144	65.5	1008	81.2
1997	216	159	64.7	1008	81.4
1997	216	214	65.2	1008	78.6
1997	216	229	64.8	1008	79.9
1997	216	244	63.7	1008	81.4
1997	216	259	63.4	1008	80.9
1997	216	314	63.0	1008	81.3
1997	216	329	62.8	1008	84.5
1997	216	344	62.5	1009	82.7
1997	216	359	62.2	1009	82.9
1997	216	414	62.6	1009	82.0
1997	216	429	62.2	1009	82.1
1997	216	444	61.7	1009	82.8
1997	216	459	60.4	1009	88.9
1997	216	514	59.3	1009	94.9
1997	216	529	58.8	1010	94.7